

# MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

WASHINGTON, D. C., OCTOBER, 1882.

WAR DEPARTMENT,  
OFFICE OF THE CHIEF SIGNAL OFFICER,  
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

## INTRODUCTION.

This REVIEW presents a general summary of the meteorological data collected by the Signal Service during the month of October, 1882.

The most prominent meteorological feature of the month has been the tropical hurricane designated as number vi., on chart i., AREAS OF LOW BAROMETER. Great loss of life and damage to property occurred during its passage over Cuba. The cyclone lost much of its energy after leaving Cuba, and before reaching the coast of the United States. Early warnings of its approach were sent to all ports on the Atlantic and the Gulf of Mexico, and the number and value of the vessels detained in the different ports on account of the warnings are published in tabular form in connection with the description of the cyclone.

An additional chart has been prepared, designated as CHART SUPPLEMENTAL TO NUMBER I., and is issued with the REVIEW for this month; it shows the tracks of storm-centres on the Atlantic ocean, after they left the coast of America, as prepared from data received up to November 25th.

With the exception of this cyclone there have been no marked meteorological features during the month. But few local storms have occurred, none of them especially severe. The month has been mild and generally favorable to agricultural pursuits.

That part of the REVIEW referring to International Meteorology presents the general weather conditions which prevailed over the northern hemisphere during the month of August, 1880. The special features in the meteorology of that month were: the high temperature, above the normal, that prevailed over northwestern Europe; the increase of barometric pressure; and the deficiency in rainfall over the same district. Chart v. exhibits the paths of barometric minima for November, 1880. This chart exhibits the tracks of the two typhoons that occurred in the China sea during the month, and which were the last typhoons of the season of 1880.

In the preparation of this REVIEW, the following data, received up to November 20th, have been used; viz.: the regular tri-daily weather charts, containing the data of simultaneous observations taken at one hundred and thirty-six Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and ninety-seven monthly journals, and one hundred and eighty monthly means from the former, and fifteen

monthly means from the latter; two hundred and five monthly registers from voluntary observers; fifty-two monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; Marine Reports, through the co-operation of the "New York Herald Weather Service;" abstracts of Ships' Logs, furnished by the publishers of "The New York Maritime Register;" monthly reports from the local weather services of Indiana, Kansas, Nebraska, and Missouri, and of the Central Pacific railway company; trustworthy newspaper extracts; and special reports.

## BAROMETRIC PRESSURE.

[Expressed in inches and hundredths.]

The mean barometric pressure for the month of October, 1882, over the United States and Canada, is shown by the isobarometric lines (in black) on chart ii. The region of highest mean-pressure is inclosed by the isobar of 30.1, and covers a narrow strip of country extending from New England southward to eastern Tennessee. Within this region the mean pressures are from 30.1 to 30.12, except on the summit of Mount Washington, where it is 30.17. Westward and southwestward of this high-pressure area the barometric means gradually decrease, and are lowest in the upper Missouri valley, the extreme northwest, and in the southern plateau. The lowest monthly means reported are: 29.84, 29.86, and 29.88 from Fort Bennett and Fort Buford, Dakota, and Saint Vincent, Minnesota, respectively. Two isobars of 29.9 appear upon the chart; one incloses parts of northern Minnesota, Dakota, and northeastern Montana, and the other, a small area in southwestern Arizona. West of the Rocky mountains the pressure is highest over the middle Pacific coast region, the highest monthly mean, 30.05, being reported from San Francisco, California.

Compared with the means of the previous month, there is an increase of pressure ranging from 0.01 to 0.13 at stations east of the eighty-second meridian. West of this meridian to the Rocky mountains, except at Denver and Pike's Peak, (where there is an increase of from 0.02 to 0.08,) the pressure is from 0.01 to 0.13 lower, the decrease being greatest in the upper lake region, the extreme northwest, and the upper Mississippi and Missouri valleys. The pressure is also lower in the north Pacific coast region and at a few stations in the northern and southern plateau districts. In the middle and south Pacific coast regions, and in the middle plateau, an increase, ranging from 0.02 to 0.14, occurs; it is most marked in the last-named district.

## DEPARTURES FROM THE NORMAL VALUES FOR THE MONTH.

Compared with the October means of previous years the pressure is below the normal everywhere, except at a few of

the most northerly stations in New England and at Visalia, California, where it is slightly above. The greatest departures occur over the northern part of the country, west of the ninety-second meridian, where they range from 0.09 to 0.24. Marked departures occur also in the middle and southern slopes, where they range from 0.08 to 0.15. In other sections of the country, the departures are less noteworthy, and range generally from 0.01 to 0.10 below the normal.

#### BAROMETRIC RANGES.

On the Pacific coast, the ranges of pressure during the month have varied from 0.29 at San Diego, California, to 1.12 at Olympia, Washington territory. East of the Rocky mountains, the ranges have varied from 0.40 at Starkville, Mississippi, and 0.41 at Memphis, Tennessee, and Vicksburg, Mississippi, to 1.03 at Marquette, Michigan, and 1.08 at Saint Vincent, Minnesota. In the several districts the barometric ranges have been as follows:

*New England:* From 0.60 at Springfield, Massachusetts, to 0.99 at Eastport, Maine.

*Middle Atlantic states:* From 0.46 at Williamsport, Pennsylvania, and 0.51 at Lynchburg, Virginia, to 0.66 at New York City, and 0.69 at Chincoteague, Virginia.

*South Atlantic states:* From 0.49 at Atlanta, Georgia, to 0.74 at Charleston, South Carolina, and 0.85 at Savannah, Georgia.

*Florida peninsula:* From 0.44 at Key West and 0.45 at Cedar Keys to 0.52 at Punta Rassa.

*East Gulf states:* From 0.40 at Starkville, Mississippi, to 0.49 at Pensacola, Florida.

*West Gulf states:* From 0.46 at Port Eads, Louisiana, to 0.66 at Denison, Texas.

*Rio Grande valley:* From 0.63 at Uvalde, Texas, to 0.73 at Eagle Pass, Texas.

*Ohio valley and Tennessee:* From 0.41 at Memphis, Tennessee, and 0.42 at Nashville, Tennessee, to 0.67 at Champaign, Illinois.

*Lower lake region:* From 0.50 at Sandusky, Ohio, and 0.52 at Cleveland, Ohio, to 0.63 at Oswego, New York, and 0.64 at Rochester, New York.

*Upper lake region:* From 0.62 at Port Huron, Michigan, to 0.98 at Escanaba, Michigan, and 1.03 at Marquette, Michigan.

*Extreme northwest:* From 0.85 at Bismarek, Dakota, and 0.86 at Moorhead, Minnesota, to 1.08 at Saint Vincent, Minnesota.

*Northern slope:* From 0.68 at Fort Maginnis, Montana, and Fort Washakie, Wyoming, to 0.98 at North Platte, Nebraska.

*Middle slope:* From 0.70 on the summit of Pike's Peak, Colorado, and 0.74 at Fort Elliott, Texas, to 0.97 at West Las Animas, Colorado.

*Southern slope:* From 0.59 at Coleman City, Texas, to 0.74 at Henrietta, Texas, and Fort Sill, Indian territory.

*Southern plateau:* From 0.39 at Fort Grant, Arizona, to 0.58 at Santa Fé, New Mexico, and 0.65 at El Paso, Texas.

*Middle plateau:* From 0.62 at Pioche, Nevada, to 0.75 at Salt Lake City, Utah.

*Northern plateau:* From 0.75 at Boise City, Idaho, and 0.76 at Eagle Rock, Idaho, to 0.99 at Dayton, Washington Territory, and 1.04 at Umatilla, Oregon.

*North Pacific coast region:* From 0.95 at Roseburg, Oregon, to 1.12 at Olympia, Washington Territory.

*Middle Pacific coast region:* From 0.48 at Sacramento, California, and 0.52 at San Francisco, California, to 0.76 at Cape Mendocino, California.

*South Pacific coast region:* From 0.23 at Los Angeles, California, to 0.47 at Visalia, California, and 0.49 at Yuma, Arizona.

#### AREAS OF HIGH-PRESSURE.

The following may be given as the general movement of areas of high barometer during the month. Six areas only are regarded as of sufficient importance to merit description. The most extensive area is number iv. During its progress across the country, frost occurred in nearly every district.

I.—This area is the same as number x. of the September REVIEW. On the morning of the 1st, the pressure had increased

over the Mississippi valley and the lake region. At the same time, areas of low-pressure existed in the extreme northwest and off Nova Scotia. On the 2d, this area moved toward the east, the centre being in the British provinces. On the morning of the 3d, the barometer stood above the mean in New England, the middle Atlantic states, the Ohio valley and Tennessee, and the lake region, while the centre continued its easterly movement and passed into the Atlantic during the evening of the 3d; the whole area, however, did not leave the coast until the 7th. The pressure, after the passage of the centre, remained above the normal in all districts east of the Mississippi river, and finally disappeared on the 7th. The highest pressure observed was 30.43, in Manitoba, on the 1st.

II.—This area appeared first off the Oregon coast on the afternoon of the 8th. The pressure increased a good deal as it moved toward the east. At the time of its appearance, an area of low barometer was central over the upper lake region. On the morning of the 9th, the centre of the area of high-pressure was in Montana, and the barometer had risen over the country from western Montana to the Mississippi river. During the evening of the 9th, the hurricane noted as number vi. of areas of low barometer was just entering the Gulf states, the pressure at this time being greatest in Dakota. As the hurricane progressed, the area of high barometer moved rapidly to the east. On the morning of the 10th, the centre of this area was at Duluth, Minnesota; on the 11th it was at Montreal, Canada; on the 12th, at Chatham, and it passed into the Atlantic by the morning of the 13th. In connection with the passage of this area across the country, killing frosts occurred in Dakota. The highest pressure observed was 30.43, at Chatham, New Brunswick, on the 12th.

III.—This area, which was of small extent, appeared on the evening of the 12th, in New Mexico. Its course was nearly northeast, and it passed into the Atlantic on the 17th. The highest pressure observed was 30.26, at Pittsburgh, Pennsylvania, on the 15th, and at Father Point, Canada, on the 16th.

IV.—On the afternoon of the 14th, the barometer rose above the normal in California. On the morning of the 15th, the line of equal pressure embraced Oregon on the north and Utah on the east, while the pressure increased in California more than 0.10 inch. On the 16th, the centre of this area came within the limits of observation, and was in Oregon, where the barometer rose more than 0.20 inch. This area was of great extent. On the morning of the 18th, the pressure was a good deal above the normal over the whole country, between the Alleghany and Sierra Nevada mountains. Its movement was easterly, and it passed into the Atlantic on the 22d. Frost occurred during its progress in the Mississippi and the Missouri valleys, in Texas, the lake region, in Canada, the Ohio valley and Tennessee, New England, and the middle Atlantic states. The highest pressure observed was 30.49, at Chatham, New Brunswick, on the 22d.

V.—This area made its appearance in Oregon on the 20th; it pursued a southeasterly course, and passed into the Atlantic, on the 25th. Frost occurred in Oregon, Montana, Michigan, Tennessee, Ohio, and North Carolina. The highest pressure observed was 30.35, at Portland, Oregon, on the 20th.

VI.—On the morning of the 24th, the pressure was above the normal in Washington Territory. By the 25th, the area had moved easterly and its centre was in Montana. On the 26th, it moved to the northern part of the Mississippi valley. The greatest rise in barometer, on the 29th, was in the New England states. This area finally passed into the Atlantic on the 29th. The movement was nearly due east. The highest pressure observed was 30.40, at Sidney, Nova Scotia.

#### AREAS OF LOW BAROMETER.

During the month there have been thirteen distinct areas of low-pressure, the centres of which have been defined sufficiently to permit of the charting of their tracks.

With the exception of numbers v. and vi., no centre has been marked by severe storms. During the progress of No. v., the wind



reached a velocity of more than twenty-five miles at all stations on Lake Michigan.

Number vi. is the tropical hurricane first noted to the west of Grand Cayman Island. The centre passed over the western part of Cuba, destroying life and property, and entered the United States on the afternoon of the 12th, on the western coast of Florida.

The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	FIRST OBSERVED.		LAST OBSERVED.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.	41 00	65 00	45 00	60 00	17.3
II.	39 30	117 00	47 00	101 00	31.3
III.	42 30	118 00	52 30	94 30	14.2
IV.	43 30	100 00	50 00	93 00	23.3
V.	42 00	93 00	49 30	60 30	35.7
VI.	19 00	82 30	34 30	74 00	14.0
VII.	43 30	101 00	49 30	76 30	36.9
VIII.	39 30	104 00	50 30	93 00	29.5
IX.	52 30	104 00	50 30	86 00	33.9
X.	45 30	98 30	48 00	79 30	29.0
XI.	50 00	103 30	47 30	78 00	33.5
XII.	50 00	126 30	50 00	66 30	34.2
XIII.	48 30	108 30	51 00	63 30	27.3

The following table gives the number of areas of low-pressure during the month of October, since 1873:

Year.	No.	Hourly velocity.	Year.	No.	Hourly velocity.
1873	13	—	1878	13	19.6
1874	9	—	1879	9	30.8
1875	10	—	1880	12	22.3
1876	9	27.7	1881	6	43.5
1877	11	20.2	1882	13	27.7

I.—This depression, of small extent, formed in the Atlantic ocean near where the centre is first located, or it is a cyclone recurring before reaching the coast of the United States, and moving with diminished energy. There are no data showing its existence before the 1st. On the morning of this date the centre was nearly south of Nova Scotia; at midnight it was east of Halifax; on the morning of the 2d, it was east of Sidney, after which it moved to the northeast, and passed beyond the limits of observations. The lowest pressure observed was 29.61, at Halifax, on the 1st. Heavy rains occurred in Nova Scotia during its passage.

II.—At midnight of the 1st, a depression of three tenths below the normal appeared in Nevada. On the morning of the 2d, it had moved to the northeast, and was central north of Salt Lake City. On the 3d, the centre was north of Bismarck, Dakota, and passed into British America, pursuing a north-east course. Rain occurred during its passage in Idaho, Montana, Dakota, and in the Missouri and Mississippi valleys. The lowest pressure observed was 29.71, on the 3d, at Moorhead, Minnesota. The wind reached a velocity of forty miles per hour, at Duluth, Minnesota, but of not more than twelve miles at all other stations in the Lake region.

III.—This depression was formed in the northern part of Nevada, and made its appearance at midnight of the 3d. On the morning of the 4th, the centre was in eastern Idaho, having moved in a northeasterly direction. On the 5th, it was north of Montana, and passed that day beyond the limits of the chart. It was accompanied by a slight rainfall in the extreme northwest.

IV.—This slight depression formed in southern Dakota, on the 6th; moved in a north-northeast direction, and passed into British America, on the 7th.

V.—On the morning of the 8th, the pressure in Iowa stood four-tenths below the normal. The centre moved to the northeast, passing over Michigan and Lake Superior, and finally passed beyond the limits of the chart, on the 9th. Rain occurred in the Missouri and Mississippi valleys, in the Ohio valley and Tennessee, and in the lake region. The wind reached

a velocity of more than twenty-five miles per hour at Milwaukee, Wisconsin; Chicago, Illinois; Escanaba, Alpena, Marquette, and Grand Haven, Michigan.

VI.—The earliest information relative to this hurricane came from scattering vessel reports. From these it appeared that an atmospheric disturbance was present in the Caribbean sea, from the 5th to the 7th, but the data are too meagre to admit of a definite location of the centre.

From reports at hand the cyclone does not appear to have exhibited much energy until the 8th, when it was central south of Cuba. On that day the bark "Tamora," off the south coast of Cuba, experienced a hurricane, in which she lost several spars and nearly all her sails. On the same day the bark "Sadie" was abandoned, during the hurricane, about thirty miles northwest of Grand Cayman Island.

The centre passed to the westward of Jamaica, at too great a distance to exert any influence over the island, beyond a slight fall in pressure, and rainy weather. From the 6th to the 8th, there was a steady decrease of pressure at Havana, Cuba, with cloudy, rainy weather, and with moderate easterly winds.

It was not till the morning of the 8th that definite information was received at this office relative to the cyclone. It was determined that the centre was then to the southeast of Havana, near Grand Cayman Island.

The following telegram was at once sent to the stations in the Gulf states, and signals were ordered:

"A cyclone is now central south of Havana, moving toward the Gulf. Dangerous storms in the Gulf within next three days. Not safe for vessels to leave port until further notice."

On the 8th, the diameter of the cyclone greatly increased, and its presence was felt over the whole Island of Cuba and westward to the coast of Yucatan and the Gulf of Mexico.

By the morning of the 9th, the centre was passing over the western part of Cuba, and the destruction to life and property was very great.

At Pinar del Rio, Cuba, about one hundred and ten miles sw. of Havana, Cuba, its violence was first felt at 2 p. m. of the 8th, when the wind increased to a hurricane force, accompanied by torrents of rain. At 7.15 p. m. there was a sudden calm, which lasted about fifteen minutes, the barometer being stationary at 29.79. The storm vortex was then directly over Pinar del Rio. After the vortex had passed, the wind regained its violence for a few minutes, then fell slowly until 5 a. m. of the 9th, when it shifted to southwest, and the weather cleared. Reports show that the greatest destruction occurred in the Vuelta Abajo (the western tobacco region of the island.) The town of Pinar del Rio was almost destroyed. At Consolacion del Sur, Cuba, 75 per cent of the houses were demolished, and at Majaqua Galvez, Pilotos, Ceja de Luna Vinales, Cuba, and other places, the damage was equally great. Thirty-six bodies were found in the vicinity of Consolacion del Sur, and many persons are missing.

At San Juan and Martinez, Cuba, 1,500 warehouses and dwellings were destroyed; in the Hacienda del Valle, Cuba, three hundred houses were ruined. Most of the houses in the township of San Luis, Cuba, were swept away, and thousands of cattle were drowned. In the district of Guane, Cuba, it is estimated that 2,000 houses and tobacco storage buildings were laid in ruins. Mr. C. Hasselbrink, the Signal Service observer at Havana, reported that, during the heavier squalls and gusts from 1 to 2 a. m. of the 9th, a curious phenomenon was observed; the noise of the wind was excessive, and sounded as if everything would be torn down, but no great force was felt; doors and windows were scarcely shaken, and not a branch of a tree was broken; the wind must have been strong at a high elevation.

The following reports, furnished by the Rev. Benito Vines, S. J., Belen College, Havana, are given.

Meteorological observations relative to the hurricane of October 8, 1882, taken at the plantation "Casualidad," (Traironas,) situated about six miles south of Pinar del Rio, Cuba:

Day.	Hour.	Barometer (aneroid).	Thermometer.	Wind.	Force.	Remarks.
Oct. 6...	10.00 p. m.	29.88	72.5	ane.	5	Misty.
7...	6.00 a. m.	29.82	69.8	ne.	5	Misty; threatening.
7...	11.00 a. m.	29.80	73.4	ne.	5	Squally; very sullen and gloomy.
7...	3.00 p. m.	29.72	71.6	ne.	5	Do.
7...	10.00 p. m.	29.72	69.8	ene.	8	Squally; horizon covered.
7...	Midnight.	29.71	69.8	ene.	8	Squally; violent gusts from the 1st quadrant.
8...	4.00 a. m.	29.65	68.0	e.	9	Steady squalls; violent gusts from ne.
8...	10.00 a. m.	29.61	68.0	ene.	10	Heavy showers; violent gusts from ne.
8...	12.00 m.	29.54	68.0	e.	10	Do.
8...	2.00 p. m.	29.37	68.0	se.	10	Do.
8...	3.30 p. m.	29.18	68.4	se.	10	Great damage; the sky assumed a leaden color, and the gusts became less strong from ne.
8...	5.00 p. m.	29.13	68.0	se.	10	Trees fell like leaves; stronger gusts from ne.; heavy showers.
8...	6.30 p. m.	29.02	68.0	se.	10	Trees fell like leaves; increased damage.
8...	7.15 p. m.	28.79	68.0	se.	10	Gusts raged with the greatest intensity from ene.; the force of the wind is indescribable; this looked like the end of the world; from 7.15 to 7.30 p. m., more or less calm, (vortex); lightning without thunder; everything illuminated.
8...	7.30 p. m.	28.79	68.0	se.	10	Terrible gusts, without precipitation.
8...	10.00 p. m.	29.13	68.0	se.	9	Dry.
8...	Midnight.	29.21	68.0	se. 1/4 s.	8	Do.
9...	1.00 a. m.	29.40	68.0	se. 1/4 s.	8	Dry; clearing; the stars visible.
9...	3.00 a. m.	29.51	68.0	sw.	7	At intervals misty.
9...	4.30 a. m.	29.54	68.0	sw.	6	Do.
9...	5.00 a. m.	29.58	68.0	sw.	5	Clear.
9...	11.00 p. m.	29.54	71.6	sw.	2	Do.

Extract of observations taken by Captain José Leonard, of the steamer "Cristobal Colon," in the Colona river, Cuba, during the 7th, 8th, and 9th of October, 1882:

Day.	Time.	Barometer.	Thermometer.	Wind.	Force.	Remarks.
Oct. 7...	6.00 a. m.	29.98	78.8	ese. to e.	5	One-half covered; darkening in sea.
7...	Noon	29.98	84.2	ese. to e.	5	Steamer cast anchor at the anchorage of Batabano.
7...	3.00 p. m.	29.92	84.2	e.	5	Cirrus clouds, diverging; dark in sea.
7...	5.00 p. m.	29.92	84.2	e.	5	This was the regular hour for departure, and steamer sailed from the river Colona.
7...	7.00 p. m.	29.92	84.4	e.	5	Clear in w. and nw., rest of horizon dark.
7...	11.40 p. m.	29.92	84.4	e.	5	Light squall with light rain, the force of the wind increased; after the squall passed, the wind relaxed, but the obscurity increased.
8...	4.30 a. m.	29.86	78.8	e.	5	Threatening and raining near the horizon.
8...	6.00 a. m.	29.86	78.8	e.	5	At the mouth of the Colona river, wind became fresh from the e., with drizzling rain. At the Colon pier we encountered strong wind; cyclone making sign of approach.
8...	Noon	29.84	78.8	e. to ene.	5	Sky covered with a veil of cirrus, stratus, and nimbus; weather misty.
8...	3.00 p. m.	29.82	69.8	e. to ene.	5	Raining in torrents.
8...	4.00 p. m.	29.80	77.0	e.	Heavy gusts.	Continued heavy squalls.
8...	5.00 p. m.	29.76	77.0	e. to ene.	Very h'y gusts.	Very threatening; the awning carried away.
8...	6.00 p. m.	29.76	77.0	se.	Very h'y squall.	The sea rose nine feet above its ordinary height; the pier to which the steamer was moored gave way, and the irresistible force of the wind caused the vessel to drag. The steamer was in danger of being totally wrecked.
8...	10.00 p. m.	29.72	77.0	a.	Irresistible squalls.	
8...	Midnight.	29.65	77.0	a.	Gusts.	
9...	1.00 a. m.	29.61	77.0	a.		Wind decreasing in strength at intervals.
9...	.00 a. m.	29.59	77.0	a. to sw.	Calm.	Lightning seen and distant thunder heard; the sea fell and wind became variable from s. to sw.
9...	4.00 a. m.	29.61	78.8	sw.	2	Cirrus and nimbus clouds.
9...	8.00 a. m.	29.69	80.6	sw.	2	Weather improving.
9...	Noon	29.78	82.4	sw.	2	Light cirrus; horizon misty.
9...	3.00 p. m.	29.82	84.2	sw.	2	Wind variable.
9...	6.00 p. m.	29.86	82.4	sw.	2	Lightly covered.

Captain Leonard says: "Not having an anemometer to measure the velocity of the wind, I think I may estimate it, without exaggeration, to have been 12 in force (Beaufort scale)."

#### DISTRICT OF SAN CAYETANO, PROVINCE OF HAVANA, CUBA.

Record of observations taken during the hurricane felt at this port on October 8 and 9:

Date.	Time.	Barometer (aneroid).	Thermometer.	Wind.	Force.
Oct. 8.....	1 p. m.	29.72	77.0	e.	2
8.....	2 p. m.	29.69	77.0	e.	2
8.....	3 p. m.	29.61	77.0	e.	2
8.....	4 p. m.	29.51	77.0	e.	2
8.....	5 p. m.	29.57	78.5	e.	3
8.....	6 p. m.	29.50	78.8	e.	3
8.....	7 p. m.	29.49	78.8	e.	4
8.....	8 p. m.	29.41	78.8	e.	4
8.....	9 p. m.	29.33	78.8	e.	4
8.....	10 p. m.	29.17	78.8	se.	4
8.....	11 p. m.	29.06	78.8	se.	4
8.....	Midnight.	28.98	78.8	se.	4
9.....	1 a. m.	29.06	80.6	s.	4
9.....	2 a. m.	29.25	80.6	sw.	4
9.....	3 a. m.	29.29	80.6	sw.	4
9.....	4 a. m.	29.33	80.6	sw.	4
9.....	5 a. m.	29.33	80.6	sw.	4
9.....	6 a. m.	29.31	80.6	sw.	3
9.....	7 a. m.	29.41	80.6	sw.	3
9.....	8 a. m.	29.41	80.6	sw.	3
9.....	9 a. m.	29.45	80.6	sw.	3
9.....	10 a. m.	29.49	80.6	sw.	3
9.....	11 a. m.	29.53	80.6	sw.	2
9.....	Noon	29.57	80.6	sw.	2
9.....	1 p. m.	29.61	82.4	sw.	2
9.....	2 p. m.	29.65	82.4	sw.	2
9.....	3 p. m.	29.69	82.4	sw.	2
9.....	4 p. m.	29.72	82.4	sw.	2
9.....	5 p. m.	29.76	82.4	sw.	2
9.....	6 p. m.	29.76	82.4	sw.	2
9.....	7 p. m.	29.80	82.4	sw.	2
9.....	8 p. m.	29.80	82.4	sw.	2
9.....	9 p. m.	29.84	82.4	sw.	2
9.....	10 p. m.	29.88	82.4	sw.	2
9.....	11 p. m.	29.92	82.4	sw.	2
9.....	Midnight.	29.92	82.4	sw.	2

According to information received, much damage was done in the districts of Vinales, Ceja Ana de Luna, and Ceja del Rio. Many tobacco warehouses and large tracts of country were flooded, and a great number of trees were uprooted.

Observations taken at Belen College, Havana, Cuba, October 7, 8, and 9, 1882.

Date.	Time.	Barometer.	Thermometer.	Wind.	Velocity in miles per hour.	Remarks.
Oct. 7...	4.00 a. m.	29.88	74.5	e.	6.7	Cirro-cumulus, cirrus, and stratus; a band stretching from ene. to wsw., 4.
7...	5.00 a. m.	29.90	74.5	e.	7.8	Cirro-stratus, stratus, and cumulus, 10.
7...	6.00 a. m.	29.94	75.7	ese.	7.8	White cirro-cumulus, and other low and gray cumulus and stratus, 9.
7...	6.38 a. m.	29.91	76.1	ese.	9.4	Cirro-cumulus, stratus, and cumulus, 8.
7...	7.00 a. m.	29.92	75.7	e.	8.6	Cirro-stratus, cirro-cumulus, and stratus, 9.
7...	8.00 a. m.	29.93	77.2	e. 3/4 se.	5.6	Cirro-cumulus, cirro-stratus, and cumulus in the n., 5.
7...	9.00 a. m.	29.93	80.1	ese.	10.1	Cirro-cumulus to stratus; rapid cumulus, 7.
7...	10.00 a. m.	29.93	82.8	se. 3/4 e.	19.0	Rapid cirro-cumulus and cumulus, 9; gusts of 22 miles.
7...	11.00 a. m.	29.92	84.3	se.	15.7	Cirro-cumulus and cumulus, 9.
7...	Noon	29.90	84.7	ese.	17.9	Almost covered with cirro-cumulus and cumulus, 10.
7...	1.00 p. m.	29.87	86.2	e. 3/4 se.	11.2	Low and rapid cumulo-stratus, 10; gusts of 18 miles.
7...	2.00 p. m.	29.85	84.6	se. 3/4 e.	17.9	Cumulus and cirro-cumulus, low cumulo-stratus from sw. to sw., 10.
7...	3.00 p. m.	29.85	84.6	se. 3/4 e.	11.2	Low cumulo-stratus, 10; gusts of 17 miles.
7...	4.00 p. m.	29.84	83.8	ese.	10.0	Misty at 3.30 p. m.; cirro-cumulus, cirrus, and cirro-stratus, rapid cumulus from sw., 10.
7...	5.00 p. m.	29.85	82.2	e.	11.2	Low cumulo-stratus, cirro-cumulus.
7...	6.00 p. m.	29.86	80.2	e.	8.9	At sunset, fragments of rainbow, the sky reddish.
7...	7.00 p. m.	29.87	81.1	e. 3/4 se.	8.9	Covered, gloomy, 10.
7...	8.00 p. m.	29.85	78.8	e. 3/4 ne.	6.7	Covered, nimbus, 10.
7...	9.00 p. m.	29.87	78.3	e. 3/4 se.	4.5	Stratus and cirrus, 10.
7...	10.00 p. m.	29.86	77.9	e.	8.9	Stratus turning into cumulus and stratus; very cloudy, 10.
8...	4.00 a. m.	29.79	77.2	e. 3/4 se.	7.8	Covered, cumulo-stratus to stratus, 10.
8...	5.00 a. m.	29.79	77.2	ene.	7.8	Do.
8...	6.00 a. m.	29.81	77.4	ese.	8.9	Covered, nimbus, light mist, rapid cumulus in ene, 10.
8...	6.38 a. m.	29.81	77.2	e.	9.4	Covered, rapid cumulus in n., 10.
8...	7.00 a. m.	29.82	77.4	ese.	10.0	Covered, misty, with constant cumulus in n. and nw., 10.



Observations taken at Belen College, Havana, Cuba, October 7, 8, and 9, 1882—Continued.

Date.	Time.	Barometer.	Thermometer.	Wind.	Velocity in miles per hour.	Remarks.
8...	8.00 a. m.	29.80	77.0	ese.	14.5	Covered, misty, with constant cumulus in n. and nw., 10.
8...	9.00 a. m.	29.81	77.0	ese.	12.3	Covered, misty, 10.
8...	10.00 a. m.	29.84	77.7	e. $\frac{1}{2}$ se.	8.8	Covered, squally; cumulus rose in se., 10.
8...	11.00 a. m.	29.81	78.3	ese.	14.5	Covered, squally; gusts of 22 miles per hour.
8...	Noon.	29.79	78.4	e. $\frac{1}{2}$ se.	22.3	Covered, squally; gusts of 24 miles per hour.
8...	1.00 p. m.	29.74	79.0	e. $\frac{1}{2}$ se.	11.2	Covered, squally; gusts of 18 miles per hour.
8...	2.00 p. m.	29.72	78.8	e.	20.1	Covered.
8...	3.00 p. m.	29.71	78.6	ese.	20.1	Stratus from se.; rain in se.; light squall.
8...	4.00 p. m.	29.69	77.5	e.	17.9	Covered, swift cumulo-stratus low in s. and se.; squally.
8...	5.00 p. m.	29.71	77.7	e. $\frac{1}{2}$ se.	17.9	Stratus, rain in s. to se.
8...	6.00 p. m.	29.71	77.7	e. $\frac{1}{2}$ se.	17.9	Light squalls, steady cirro-cumulus; gusts of 29 miles per hour.
8...	7.00 p. m.	29.69	75.7	e.	13.4	Heavy squalls at 7.16 p. m.; lightning in se.; gusts of 31 miles per hour.
8...	8.00 p. m.	29.71	76.5	e. $\frac{1}{2}$ se.	17.9	Covered, nimbus; continuous squalls at 8.30; heavy squall, 22 miles.
8...	9.00 p. m.	29.72	77.2	e. $\frac{1}{2}$ se.	21.3	Continuous squalls, lightning in sw.
8...	10.00 p. m.	29.71	78.3	e.	15.7	Heavy squalls, steady nimbus at 9.30 p. m.
8...	10.30 p. m.	29.71	.....	se. $\frac{1}{2}$ se.	23.5	At 10.15 and 10.45 p. m. heavy squalls; gusts of 49 miles per hour.
8...	11.00 p. m.	29.71	.....	se.	31.3	Violent wind gusts from ese, and e. at 11.15, without rain.
8...	11.30 p. m.	29.70	.....	ese.	16.8	11.34 p. m., light rain began.
8...	Midnight.	29.69	.....	ese.	17.9	Misty; heavy wind gusts at 12.10 a. m.; lightning in s. and sw.
9...	12.30 a. m.	29.66	.....	se.	16.8	Light cumulus without rain.
9...	1.00 a. m.	29.67	78.1	se. $\frac{1}{2}$ se.	24.6	Rapid cumulus; sudden squalls of wind and rain; lightning at 1.26 a. m.; gusts of 40 miles.
9...	1.30 a. m.	29.65	.....	se. $\frac{1}{2}$ se.	23.5	Cirro-cumulus moving rapidly; lightning in se.; gusts of 33 miles.
9...	2.00 a. m.	29.64	.....	ese.	23.7	Rapid stratus and cumulus, lightning in e., misty; at 2.15 a. m.; gusts of 40 miles.
9...	2.30 a. m.	29.64	79.2	ese.	17.9	Lightning in e.; gusts of 40 miles.
9...	3.30 a. m.	29.63	.....	ese.	23.5	Heavy squall, 44 miles.
9...	4.00 a. m.	29.65	79.9	ese.	22.4	Squally, strong, sudden gusts of wind; low cumulus.
9...	4.30 a. m.	29.65	.....	ese.	28.0	Sudden gusts from se. and ese.; the whole horizon very gloomy.
9...	5.00 a. m.	29.64	.....	ese.	26.8	Rapid cumulus and stratus; at 5.20 a. m. the wind changed to sw.; gusts of 35 miles.
9...	5.30 a. m.	29.68	79.2	e. $\frac{1}{2}$ se.	20.1	Low cumulo-stratus.
9...	6.00 a. m.	29.69	78.2	se. $\frac{1}{2}$ se.	24.6	The aspect bad in sw. and wsw.
9...	6.38 a. m.	29.70	80.8	ese.	23.7	Wind veering to e.; rain began 6.38 a. m.
9...	7.00 a. m.	29.71	78.8	s.	22.4	Raining in sw.
9...	8.00 a. m.	29.74	79.5	s.	22.4	Covered; nimbus; wind squally, shifting from sw. and w.; misty.
9...	9.00 a. m.	29.75	79.9	s.	23.5	Rapid cumulus; 9.32, a. m.; squalls of 31 miles velocity.
9...	10.00 a. m.	29.76	80.8	s.	24.6	10.33, a. m.; heavy squalls of short duration, 33 miles.
9...	11.00 a. m.	29.76	82.2	s.	24.6	Rapid and low cumulo-stratus and high cumulus.
9...	Noon.	29.76	82.0	s.	20.1	Upper clouds moving very rapidly.
9...	1.00 p. m.	29.76	83.5	s.	24.5	12.08 p. m., squally, with sudden gusts of 31 miles.
9...	2.00 p. m.	29.74	83.5	s.	22.4	Very rapid and low cumulus, dense cirro-cumulus.
9...	3.00 p. m.	29.75	82.0	s.	22.4	Cumulo-stratus to stratus; stratus and cumulo-stratus low in the sw.
9...	4.00 p. m.	29.76	82.2	s.	17.9	Cirro-stratus, cumulus and cumulo-stratus.
9...	5.00 p. m.	29.78	81.1	s.	13.4	Cumulus, cumulo-stratus and dense cirro-cumulus from nw.
9...	6.00 p. m.	29.80	80.1	s.	14.5	Low and rapid cirro-stratus; cumulus; sunset reddish.
9...	7.00 p. m.	29.82	80.1	s.	12.3	Stratus and lightning in the nw.
9...	8.00 p. m.	29.85	79.5	s. $\frac{1}{2}$ sw.	6.7	At 7.45 p. m., squally and misty, wind s. and sw., very gloomy.
9...	9.00 p. m.	29.86	79.2	s. $\frac{1}{2}$ sw.	6.8	Cumulus and stratus.
9...	10.00 p. m.	29.86	79.0	s. $\frac{1}{2}$ sw.	8.9	Do.

At 9.30 a. m. of the 9th, a southeast gale and heavy rain were felt at Key West, where signals were flying. Cautionary signals were immediately ordered at all stations from New York City south, and the observers were warned of the approach of the dangerous storm.

The following special warning was sent at 12 m. to the secretary of the Maritime Exchange, New York City: "East to south gales continue in southern Florida. Cyclone central in east Gulf, southeast of Pensacola, moving northward."

The gale continued all day, at Key West, on the 9th and 10th.

On the 10th, the storm was felt at Jacksonville, the wind reaching a velocity of forty-four miles an hour. Signals had been displayed at this place for thirty hours before the storm appeared. The centre of the cyclone at 7 a. m. was south and west of Cedar Keys.

The gale began at Cedar Keys about 4 a. m. of the 10th, though the approach of the cyclone was felt on the 9th; the wind, accompanied by rain, blew briskly from the ne. The wind, on the morning of the 10th, veered from ne. to e., steadily and gradually shifting during the day to se. and s., increasing in force until it attained a velocity of fifty-six miles. This greatly alarmed the residents, who feared that the tide would again inundate the streets and repeat the damage done by the September cyclone. During the night of the 10th, the water reached its highest point, flooding all the lower part of the town, washing away great quantities of logs, timbers, etc. The gale ended about 9 a. m. on the 11th, the wind veering to nw. The centre passed over the northern part of Florida, and by the morning of the 11th, was in southeastern Georgia.

At 1 a. m. of the 11th, the following telegram was sent to the Maritime Association, New York City: "Cyclone has moved to northern Florida, having lost much of its energy, but the indications are that it will move northeastward along the Atlantic coast, accompanied by dangerous easterly winds off the coast."

At 10 a. m., same date, the following was sent to the association: "The cyclone has increased in energy. It is now central in northern Florida. Southeast gales are reported near Jacksonville. Barometer 29.55. It is not safe for vessels to sail for southern ports."

At 5.30 p. m., the following was sent to the observers at Boston, New York City, Philadelphia, Baltimore, and Norfolk: "Communicate with captains of vessels and shipmasters. Give warning it is not safe to leave port. Cyclone is central near Savannah, moving slowly northeast. Violent gales are reported on the south Atlantic coast."

On the afternoon of the 11th, the centre of the cyclone was near Savannah. Signals had been displayed there for sixteen hours before the storm appeared. The wind blew at Charleston, forty miles and at Savannah, thirty-eight miles per hour.

The storm continued up the Atlantic coast, following the trend of the shore, and finally passed off to the east of Cape Hatteras on the 12th. Signals were displayed at all ports as far north as Boston, and at all these places a very severe northeast gale blew, the velocity of the wind ranging from twelve to forty-two miles an hour.

The following is a brief synopsis of reports received from stations in the United States lying within or near the track of the cyclone:

Key West.—From 4.30 to 10 a. m. of the 9th, the barometer rose slightly, and from 10 to 12.30 p. m. fell .05 inch; after 12.30 it rose steadily. The storm began at 4 a. m. and ended at 10.30 p. m. The wind veered from se. to s. between 1 and 1.30 p. m. The schooner "O. M. Remington," from Ruatan, Bay Islands, Honduras, to Philadelphia, arrived at Key West on the night of the 9th, and reported having encountered the cyclone in latitude N. 23° 30' and longitude W. 84°, on the night of the 7th. She experienced high east winds and had her jibboom, bowsprit and sails carried away. The vessel was badly strained and leaking. The brig "Emily T. Sheldon," from New York to Galveston, encountered the storm on the morning of the 8th, in latitude 23° 40' N., and longitude 82° 30' W. She experienced high se. to sw. winds, and lost her mainmast and sails. The Norwegian bark "Plimsoll" experienced high easterly winds, on the morning of the 8th, in latitude 23° 40' N., and longitude 83° 40' W. At noon came a calm, lasting for three hours, when the wind changed to w. and blew with great violence for two hours. It then backed to sw. and moderated. The vessel had her sails and bulwarks blown away and her topmast broken during the gale.

Punta Rasa.—The barometer fell steadily on the 9th, until 6 p. m., when it read 29.65, after which it rose. Brisk easterly winds prevailed till about 7.30 p. m., when the wind veered to se. and continued with increasing force up to midnight; it then shifted to s., reaching the maximum velocity of forty-two miles at 11.35 p. m. After midnight the wind veered to sw.

and blew with diminished force. The barometer rose slowly during the 10th.

Cedar Keys.—The storm raged with violence, accompanied by very heavy rains, on the 10th. The telegraph line was blown down and the railroad trestle was washed away, causing delay of trains. The storm continued until the morning of the 11th. The maximum velocity recorded was fifty-two miles.

Charleston.—Rainy and stormy during the whole day of the 11th. There was very heavy rain with high ne. gale. Fences, chimneys and trees were blown down. The schooner "Maggie J. Lawrence" encountered the storm when she was about fifteen miles from Charleston; she lost all her sails.

Cape Lookout.—At 10 a. m. of the 11th, the wind backed to ne. and increased in velocity, blowing with terrible force during the day, while rain continued without cessation.

The following table has been prepared showing the property detained in port by the signals:

Property detained in port during October cyclone.

Port.	Number and description of vessels.	Value of vessel.	Value of cargo.	Total value.
Provincetown, Mass.	200 schooners.			\$1,600,000
New London, Conn.	3 coast survey schooners.			
	1 United States steamer.			
	1 steam-tug and 4 barges.			60,000
	1 steam-tug and 3 barges.			35,000
	1 steam-tug and 2 barges.			25,000
	1 steam-tug and 2 barges.			20,000
	1 steam-tug.			10,000
	1 steam-tug and 4 barges.			15,000
	2 barges (a).			60,000
	3 brigs (a).			
	5 schooners (a).			
	Schooner.			20,000
	Schooner.			20,000
	Schooner.			35,000
	Schooner smack.			1,500
	Schooner smack.			2,000
	Schooner smack.			1,500
	Schooner smack.			1,500
	Schooner smack.			2,000
	Schooner smack.			2,000
	Schooner smack.			2,000
	Schooner smack.			10,000
	Steam yacht.			40,000
	Schooner yacht.			20,000
	Schooner yacht.			15,000
	Schooner yacht.			25,000
	Schooner yacht.			15,000
	Sloop yacht.			12,000
New Haven, Conn.	9 steamers and 40 sailing vessels.			420,000
Wilmington, N. C.	Schooner.	\$16,000	\$3,800	19,800
Smithville, N. C.	Bark.	20,000	19,000	39,000
	Bark.	15,000	7,000	22,000
	Steamer.	12,000	50,000	62,000
	Brig.	6,000	9,000	15,000
	Brig.	8,000	7,000	15,000
Savannah, Ga.	Steamship.	265,000	190,000	455,000
	Bark.	25,000	4,500	29,500
	Brig.	20,000	3,500	23,500
	Schooner.	15,000	4,200	19,200
	Bark.	16,000	4,500	20,500
	Brig.	16,000	10,000	26,000
	Schooner.	10,000	1,000	11,000
Norfolk, Va., b.	Three-masted schooner.			40,000
	Three-masted schooner.			40,000
	Two-masted schooner.			5,000
	Fishing steamer.			8,000
Charleston, S. C.	Schooner.	12,000	4,900	16,900
	Schooner.	16,000	6,700	22,700
Newport, R. I.	Schooner.	10,000	3,000	13,000
	Schooner.	12,000	1,500	13,500
	Schooner.	12,000		12,000
	Schooner.	5,000		5,000
	Schooner.	5,000		5,000
	Steamer.	11,000		11,000
	Schooner yacht.	75,000		75,000
	Schooner yacht.	75,000		75,000
	60 fishing smacks.	15,000		15,000
Block Island, R. I.	Steamer.	125,000	150,000	275,000
Key West, Fla.	Steamer.	26,000		26,000
Cedar Keys, Fla.	Brig.	12,000	2,500	14,500
	Schooner.	18,000	2,500	20,500
Jacksonville, Fla.	Schooner.	20,000	4,000	24,000
	Schooner.	12,000	2,800	14,800
	Schooner.	15,000	4,000	19,000
	Schooner.	25,000	4,200	29,200
	Schooner.	15,000	5,140	20,140
	Schooner.	20,000	4,600	24,600
	Schooner.	15,000	2,900	17,900
	Schooner.	12,000	2,400	14,400
	Schooner.	15,000	4,500	19,500
	Schooner.	12,000	4,000	16,000
	Schooner.	20,000	4,800	24,800
	Schooner.	25,000	5,000	30,000
	Schooner.	15,000	3,400	18,400
	Schooner.	25,000	4,600	29,600
	Schooner.	30,000	5,500	35,500
	Schooner.	20,000	5,000	25,000
	Schooner.	20,000	4,800	24,800

Property detained in port during October cyclone—Continued.

Port.	Number and description of vessels.	Value of vessel.	Value of cargo.	Total value.
Fort George Island, Fla.	Schooner.	30,000	4,500	34,500
(Continued.)	Schooner.	30,000	4,500	34,500
	Schooner.	3,000	2,000	5,000
Fernandina, Fla.	Schooner.	25,000	5,000	30,000
	Schooner.	20,000	4,000	24,000
Baltimore, Md., c.	1 brig.			35,000
	1 brig.			38,500
	1 brig.			55,000
	1 brig.			60,000
Delaware Breakwater, Del.	1 steamer.	60,000	47,500	107,500
	1 ship.	50,000	Ballast	50,000
	3 barks.	90,000	125,000	215,000
	1 brig.	20,000	15,000	35,000
	50 schooners.	600,000	100,000	700,000
	12 schooners.	120,000	32,000	152,000
	10 schooners.	115,000	Ballast	115,000
	1 schooner.	17,000	10,000	27,000
Cape Lookout, N. C.	3 sloop yachts.			6,000
	1 smack.			1,500
	2 schooners.			3,000
	1 weir net.			2,500
	1 steamer.			3,000
	Fishing outfit.			500
Total.				6,061,393

a Anchored in lower harbor; value could not be ascertained.

b A large number of vessels were detained at Hampton Roads, of which the observer was unable to obtain names, cargoes, or values. Other vessels detained at the port sailed before the receipt of instructions to gather statistics.

c A large number of vessels were detained in lower harbor.

The report of the observer at New York is very interesting, although it was impossible for him to obtain statistics of the value of the property detained from going into the cyclone. One brig, two barks, and one hundred and forty schooners anchored at Hell Gate. These were mostly coasters, but \$900,000 is a very low estimate of their value, without considering their cargoes. The larger vessels anchored in "the narrows," and it is estimated that, besides several steamers, there were two hundred ships, barks, and brigs, and one hundred and fifty schooners, all worth at least from \$8,000,000 to \$10,000,000. The observer, who had the assistance of the secretary of the New York Maritime Association, estimates that many millions of property was saved from jeopardy by observing the warnings. The experience of the September cyclone impelled ship-masters to pay unusual heed to the signals. The storm, outside the harbor, was of great severity. The captains of the Long Island Sound steamers report it "the severest on record;" they were compelled to seek harbor. Three coastwise steamers that put to sea were obliged to return to port, and the only sailing vessel, a brig, that sailed in disregard of the signals, between the 11th and 13th, was forced back. When the storm was over, and the signals were lowered, so many vessels left the harbor together that people went to see them sail. The beautiful and unusual sight was described in the daily newspapers; the "Telegram" stating that fifteen steamers and two hundred sailing vessels passed through "the narrows" on the 14th.

This cyclone undoubtedly formed in the Caribbean sea, south of Grand Cayman Island, and recurved over the western part of Cuba. It has been traced, as far as possible, after leaving the coast of America, over the Atlantic by the following reports, furnished through the co-operation of the marine observers of the Signal Service, and of the "New York Herald" weather service: 14th, s. s. "City of Alexandria," in N. 35° 36', W. 75° 13', wind nnw., force 6, overcast, light rain. 15th, bark "Julia H.," in N. 38° 6', W. 65° 23', wind se., force 10. On the 13th, 14th, and 15th, numerous vessels, near N. 45°, W. 45°, reported strong nw. and wnw. gales and rain. The brig "Teresina," which left Philadelphia for Oporto on October 3, reported: 16th, heavy nne. to ne. gale, several sails carried away, bulwarks stove, and vessel much damaged. 17th, s. s. "Bohemian," in N. 48° 48', W. 46° 08', nw. gale, very high sea; s. s. "Britannic," in N. 48° 25', W. 40° 34', strong nw. wind to fresh gale. On the 18th, the storm-centre was probably between W. 35° and W. 25°. The s. s. "Gallia," in N. 50° 16', W. 24° 8', reported, on the 17th, lowest barometer, reading 28.75, wind veered to squalls from s. to e., ne. and nw., and blew a perfect gale for several hours. On the 18th



the same vessel, in N. 49° 06', W. 30° 39', encountered nw. gale, force 9. On the same day, the s. s. "Arizona," near N. 50°, W. 30', reported barometer 29.15; wind suddenly shifted from s. by w., force 3, to n. by w., force 9, with high cross sea, one sea coming from the west, and another from the north. The gale lasted about fourteen hours, with very hard squalls.

Captain C. Ludwig, commanding the s. s. "Westphalia," furnishes the following: 17th, in N. 50° 57', W. 24° 50', barometer 29.19, falling; the wind went slowly but steadily to south, and, between noon and 4 p. m., it passed through east to north, slowly increasing, and accompanied by heavy rains. At 4 p. m., the barometer read 28.78, and between 5 and 6 p. m. the gale broke suddenly out from the nw., force 11; at the same time the sea-swell rose from moderate to very heavy. The gale continued, with very high sea and rain, and totally clouded sky, until 10 p. m. After that hour the sky began to clear, while the wind increased to force 10, at 11 p. m. At midnight, the barometer began to rise, but very heavy squalls of force 11, continued, without rain, until 4 a. m. of the 18th. The s. s. "Colima," in N. 52° 12', W. 28° 11', reported: 9.30 p. m., barometer 28.74, wind n.  $\frac{1}{2}$  e., force 11, with heavy rain; at 10 p. m., wind ne. by n., force 12, raining, barometer 28.55. On the 19th, 4 a. m., barometer 28.46, wind nw.; force 10.

VII.—This depression formed in western Nebraska, on the 11th, and pursued rather an erratic course. At first the movement was to the northeast, changing to the northwest, and re-curling, on the 12th, west of Manitoba; after this, its course was about east-southeast. On the morning of the 13th, the centre was north of Lake Superior. During the afternoon, the course was again changed. It now began to move toward the northeast, and passed the limits of observation. The lowest pressure observed was 29.23, on the 12th, at Fort Garry, Manitoba. At nearly every station in the upper lake region, the wind reached a velocity of more than twenty-five miles. Rain fell, during its passage, in Montana, Dakota, the Missouri and Mississippi valleys, and the lake region.

VIII.—This depression made its appearance in Colorado, on the 14th, and moving in a direction nearly northeasterly, passed into British America, on the 15th. The lowest pressure observed was 29.34, at Fort Garry, Manitoba, on the 15th.

IX.—On the morning of the 19th, the reports showed that a depression was moving across British America, the centre at that time being some distance north of Montana. By the 20th, it had disappeared. The disturbance was so slightly felt in the United States that a description is considered unnecessary.

X.—On the morning of the 21st, a sharp fall occurred in Dakota. The depression thus formed, moved in a direction north of east; the centre passed over Minnesota, Lake Superior, and Canada, and disappeared, on the 23d. Rain occurred in the northern Mississippi valley, the lake region, and the New England states. The lowest observed pressure was 29.70, at Escanaba, on the 22d. The wind reached a velocity of more than twenty-five miles at Duluth, Minnesota, Marquette and Escanaba, Michigan.

XI.—This depression formed in British America, north of Montana, and was first noted on the morning of the 24th. The movement was to the southeast till midnight, the centre then being at Duluth, Minnesota. From this point the course was to the north of east. Following the Saint Lawrence river, it passed into the Atlantic, on the 26th. The lowest observed pressure was 29.24, at Sydney, Cape Breton Island, on the 25th. Light rains occurred in Canada and the New England states.

XII.—This area made its appearance on the coast of British Columbia, on the 26th. The centre moved across British America, pursuing an easterly course, and passed into the Atlantic, on the 30th. The lowest pressure observed was 29.40, at Fort Garry, Manitoba, on the 27th.

XIII.—This depression was first noted in Montana, on the 29th, though it is evident that a disturbance existed in British Columbia, on the 28th. The movement was southerly until the morning of the 30th, the centre then being in southern

Dakota. The course changed to the northeast, and the last trace had of it was at Cape Rozier, province of Quebec, on the 31st. The lowest observed pressure was 29.40, at Marquette, Michigan, on the 30th. Light rains occurred in Montana, Dakota, the Missouri and Mississippi valleys, the lake region, and the New England states.

#### INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of this REVIEW. Chart iv. is published for August, 1880, and continues the series of that chart begun in January, 1877. Chart v. is prepared for November, 1880, and continues the series of that chart begun November, 1877. For the description of these charts, much valuable information has been obtained from the "Monatliche Uebersicht der Witterung," published by Professor Dr. G. Neumayer, Director of the German Marine Observatory at Hamburg, and from the "Bulletin Mensuel," published by Mr. Marc Dechrezens, of Zi-Ka-Wei, China.

Chart iv. exhibits the mean pressure, mean temperature, and the prevailing direction of the wind over the northern hemisphere, and at certain isolated stations in the southern hemisphere, as determined from one observation taken each day at 7:35 a. m. Washington, or 0.43 p. m. Greenwich mean time.

The mean pressure is lowest over the continent of Asia, where it ranges from 29.50 (749.3) over British India, to 29.80 (756.9) in Siberia, and in China and Japan.

An area of low-pressure, 29.80 (756.9), occupies Iceland, and extends, with decreasing pressure, westward over Greenland, where the mean pressure for the month is 29.58 (751.3) at Godthaab.

The isobar of 29.90 (759.4) covers the Gulf of Saint Lawrence, and extends northeastward, over the ocean, to the extreme northern limits of Scandinavia; it then trends south-westward and occupies southeastern Europe.

The area of highest mean pressure 30.20 (767.1) is shown over the Azores, while high-pressures, 30.00 (762.0) to 30.10 (764.5), occupy the North American continent, the Atlantic ocean and western Europe. In the United States, the area of barometric maxima covers the north Pacific coast, where the mean pressure ranges from 30.00 (762.0) to 30.06 (763.5).

Compared with the preceding month (July), the mean atmospheric pressure has increased over the United States, except in southern California and the Florida peninsula, where a slight decrease has occurred. In Canada, there is a general increase of pressure throughout the Dominion.

In Europe, the mean barometric pressure has increased considerably in the northern and northwestern parts of the continent; the largest increase appears over the British Isles and the Scandinavian peninsula.

In central Europe, the pressure has remained unchanged, and in the southern peninsulas, a slight decrease is shown.

In Greenland, the pressure has materially decreased, the mean pressure at Godthaab being .23 inch below that of July, 1880.

In Morocco, Algeria, and Tunis, the pressure has decreased about .05 inch.

In Asia, the changes are unimportant, except over the region lying north of the fiftieth parallel, where there is an increase of .07 inch.

Compared with the corresponding month of previous years, the mean pressure is above the normal along the Atlantic coast of the United States, and westward to the eighty-fifth meridian. In the interior, the Florida peninsula, and over the Gulf of Mexico, the pressure is below the normal, the greatest deficiency, .07 inch, being reported from Florida. In Canada, the pressure is above the normal.

The following table shows the mean pressure and mean temperature, with corresponding departures, for the month of August, 1880, in the several countries of Europe and Asia, compared with the means as determined from observations taken during the years 1877, 1878, and 1879:

Countries.	Mean Pressure.			Mean Temperature.		
	August, 1877, 1878 and 1879.	August, 1880.	Depart- ure.	August, 1877, 1878 and 1879.	August, 1880.	Depart- ure.
Algeria.....	30.01	29.95	-0.06	80.4	80.3	+ 0.1
Austria.....	29.96	29.87	-0.09	75.3	71.1	- 4.2
British Isles.....	29.96	30.01	+0.05	63.4	66.5	+ 3.1
Denmark.....	29.90	29.98	+0.08	64.3	68.7	+ 4.4
France.....	29.91	29.95	+0.04	75.0	75.5	+ 0.5
Germany.....	29.91	29.95	+0.04	70.1	70.5	+ 0.4
India.....	29.91	29.95	+0.04	82.6	83.0	+ 0.4
Italy.....	29.95	29.89	-0.06	83.2	78.0	- 5.2
Norway.....	29.78	29.99	+0.21	63.3	67.0	+ 3.7
Portugal.....	30.01	29.97	-0.04	80.8	78.0	- 2.8
Russia.....	29.85	29.86	+0.01	70.7	73.4	+ 2.7
Spain.....	29.95*	29.93	-0.02	81.7*	80.0	- 1.7
Sweden.....	29.81	29.97	+0.16	63.7	69.3	+ 5.6

\* Mean for two years only.

The accompanying table shows the deviations in pressure and temperature at isolated stations during the month of August, 1880, as compared with the means of three years: Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Pressure.			Mean Temperature.		
	August, 1877-78-79.	August 1880.	Departure.	August, 1877-78-79.	August, 1880.	Departure.
San José, Costa Rica, C. A.....				66.3	66.4	+ 0.1
Gibraltar.....	29.96	29.95	-0.01	79.9	78.0	- 1.9
Malta, Mediterranean Sea.....	29.95	29.90	-0.05	84.4	83.8	- 0.6
Sandwich Manse, Orkney Islands.....	29.76	30.04	+0.28	56.7	61.1	+ 4.4
Bridgetown, Barbadoes.....	29.99	29.97	-0.02	84.2	81.3	- 2.9
Cape Town, Cape Good Hope.....	30.10	30.10	-0.00	60.6	61.8	+ 1.2
Fort Napier, Natal, South Africa.....	30.02	29.91	-0.11	69.3	72.4	+ 3.1
Freetown, Sierra Leone.....	30.00	29.97	-0.03	70.8	83.6	+ 12.8
Mauritius, Indian Ocean.....	30.18	30.30	+0.12	71.8	71.2	- 0.6
Melbourne, New South Wales.....	30.11	29.99	-0.12	49.9	51.5	+ 1.6
Nassau, Bahamas.....	30.01	30.00	-0.01	84.2	82.7	- 1.5
Godthaab, Greenland.....	29.86	29.98	+0.12	45.7		
Stykkisholm, Iceland.....	29.86	29.72	-0.14	51.7	56.1	+ 4.4
Thorshavn, Faroe Islands.....	29.83	29.95	+0.12	51.9	57.9	+ 6.0
Port-de-France, Martinique.....	29.84	30.15	+0.31	80.2	79.3	- 0.9
Zi-Ka-Wei, China.....	29.81	29.74	-0.07	77.4	73.9	- 3.5
Athens, Greece.....	29.89	29.85	-0.04	85.1	85.6	+ 0.5
Lahore, British India.....	29.49	29.48	-0.01	69.9	96.1	+ 26.2
Cagliari, Sardinia, Italy.....	29.94	29.89	-0.05	85.1	82.2	- 2.9
Tokel, Japan.....	29.85	29.83	-0.02	76.1	75.1	- 1.0
Tromsø, Norway.....	29.78	29.88	+0.10	52.8	55.6	+ 2.8
Angra, Azores.....	30.10	30.26	+0.16	72.9	73.4	+ 0.5
Funchal, Madeira Islands.....	30.10	30.10	normal	76.3	75.6	- 0.7
Ponta Delgado, Azores.....	30.13	30.21	+0.08	76.2	74.8	- 1.4
Archangel, Russia.....	29.76	29.91	+0.15	68.8	64.8	- 4.0
Tiflis, Russia.....	29.79	29.75	-0.04	84.1	87.1	+ 3.0
Astrakhan, Russia.....	29.86	29.85	-0.01	79.9	83.3	+ 3.4
Ekatrinburg, Russia.....	29.73	29.81	+0.08	68.8	68.2	- 0.6
Nukusa, Turkistan, Asia.....	29.75	29.77	+0.02	85.1	88.7	+ 3.6
Tashkent, Turkistan, Asia.....	29.78	29.70	-0.08	81.8	81.9	+ 0.1
Barnaul, Siberia, Asia.....	29.74	29.72	-0.02	67.7	66.6	- 1.1
Yeniseisk, Siberia, Asia.....	29.75	29.83	+0.08	64.0	64.8	+ 0.8
Pekin, China.....	29.76	29.75	-0.01	75.9	76.8	+ 0.9
Nikolievsk on the Amoor, Asia.....				58.9		
San Juan de Puerto Rico, W. I.....	29.90	30.02	+0.12	81.4	82.6	+ 1.2
Beirut, Turkey in Asia.....	29.78	29.79	+0.01	80.3	87.6	+ 7.3
Mexico, Mexico.....	30.08			56.7		
Havana, Cuba, W. I.....	29.90	30.02	+0.12	81.7	81.0	- 0.7
Paramaribo, D. Guiana, S. A.....	30.02	29.97	-0.05	81.6	79.8	- 1.8
York Factory, B. A.....	29.80	30.03	+0.23	48.2	42.6	- 5.6

In the United States, the temperature is normal, or below the normal, in all parts of the country, except in Tennessee, where it is 1° above. The greatest deficiencies occur in Dakota and in southern Texas.

In Canada, the temperature is slightly below the normal.

In Europe, the mean temperature of the air is generally above the normal in the northwestern part of the continent, the largest excesses occurring in the British Isles and in Scandinavia. In the southern and southwestern districts, the temperature is below the average, notably in Austria and in Italy.

In British India, the temperature is slightly below the normal; the highest mean, 96° 1 Fahr. (35° 6 Cent.), is reported from Lahore, and the lowest, 69° 8 Fahr. (21° 0 Cent.), at Belgaum, (elevation of station, 2,629 feet).

The following are some of the extreme monthly mean temperatures reported at isolated stations:

HIGHEST.	Degrees.	LOWEST.	Degrees.
Nukusa, Asia.....	88.7	York Factory, British America.....	42.6
Beirut, Asia.....	87.6	Tromsø, Norway.....	55.6
Tiflis, Russia.....	87.1	Stykkisholm, Iceland.....	56.1
Athens, Greece.....	85.6		

In the United States, the prevailing directions of the wind are: southerly and southeasterly from the ninetieth meridian, westward to the Pacific, except on the Pacific coast, where it is northerly. East of this meridian, the prevailing winds are as follows: easterly and northeasterly in the states lying south of the thirty-fifth parallel, northerly in Michigan and Wisconsin, and southwesterly in the region lying between the limits just named.

In Europe, the winds are northeasterly in the central and northwestern parts of the continent; in the southern peninsulas, they are generally southwesterly, and in Scandinavia southerly.

In Algeria, Morocco, and Tunis they are easterly and northerly.

In British India, the prevailing winds are westerly and southwesterly.

In China, they are easterly, and in Japan, they are southerly.

Over the north Atlantic ocean, the prevailing wind is southwesterly, from the coasts of the United States, eastward to the twenty-fifth meridian.

In the Bay of Biscay, and on the coasts of Spain and Portugal, they are northwesterly.

The rainfall of the month is in excess of the average in the interior and in the northeastern parts of the United States. It is below the average in all other districts, except in Florida, where a large excess occurs. In the Canadian maritime provinces, it is below the average. In other parts of Canada, there is a slight excess.

In northwestern Europe, the rainfall was generally below the average, while in Austria and the southeastern districts, it was considerably above the average, causing floods in many sections.

A noteworthy feature in the meteorology of the month is the occurrence of four West Indian hurricanes, and of four typhoons in the China sea. (See chart v. for August, 1880.)

Chart v. exhibits the paths of barometric depressions which have been traced from the daily international charts for the month of November, 1880.

The data are charted for each day of the month on the charts accompanying the "International Bulletin" for that day, and from these charts and from additional reports, are traced the movements of the centres of barometric minima.

Thirty-one of the principal storms that have occurred over the northern hemisphere have thus been traced. The following concerns the general distribution of these depressions:

Eleven appeared over the United States and Canada; of these, four, numbers iv., v., vii. and viii.,—have been traced from the interior of the country to the Atlantic coast, and thence eastward over the ocean to the European coasts.

Sixteen depressions are exhibited over Europe; thirteen of these traversed the northern and western parts of the continent, from southwest to northeast, while three depressions appeared in southern Europe, and moved in a course slightly south of east.

Three depressions are traced in eastern Asia, and one is shown over the Pacific ocean. This chart also exhibits the tracks of two typhoons that occurred over the China sea during the month; they were the last storms of that class during the typhoon season of 1880.

The following are brief descriptions of the storms first appearing in the United States and Canada:

I.—This area was probably a continuation of low area ix. of the October chart. The disturbance was central in northern Maine on October 31; it moved northeastward, and was over the Gulf of Saint Lawrence, November 1, the pressure at Father Point being 29.53 (750.0), wind nw., 38 miles, weather threatening. On the 2d, the depression passed north-northeastward and disappeared over Labrador.

II.—This depression developed apparently in Manitoba, and moved by a southeasterly course to Minnesota, where it was central, on the 2d. During the 3d and 4th, the disturbance continued its southeasterly movement, and on the 4th, was central



in Iowa. The course then changed to northeasterly, and the centre of disturbance moved over Lakes Michigan and Superior, causing rain and fresh easterly winds in Ontario. On the 5th, the depression finally disappeared north of Lake Superior.

III.—The centre of this disturbance became well-defined first in Kansas on the morning of the 3d. Moving thence northeastward, the depression united with low area ii., on the 4th.

IV.—This depression, which was of cyclonic origin, developed probably in the Gulf of Mexico. During the 5th, there was a marked decrease of pressure in the Gulf states, and by the 6th, an area of low pressure extended from Tennessee northward to the lake region, the lowest barometer being reported from Chattanooga, Tennessee, 29.70 (754.4), wind s., heavy rain. Moving rapidly northeastward, the centre of disturbance reached the Saint Lawrence valley on the 7th; it was attended by heavy rains and by southerly to easterly winds, changing afterward to strong westerly gales over the province of Ontario and the lakes. During the 7th and 8th, the storm-centre moved eastward, and on the latter date reached the Gulf of Saint Lawrence, causing strong westerly gales in the maritime provinces. By the 9th, the disturbance had moved to the eastward of Newfoundland, and was central probably near N. 50°, W. 54°. On the 10th, the disturbance, moving eastwardly, was central near N. 53°, W. 40°, the s. s. "Peruvian," in N. 53° 45', W. 44° 46', reporting wsw. wind of force 6, and squally weather; and the s. s. "Celtic," in N. 47°, W. 46°, strong wnw. gale, heavy sea. During the 11th and 12th, the storm was central near N. 53°, W. 25°; on the 12th the area of lowest pressure presented the form of an extended trough covering the ocean, from N. 45°, W. 35°, northeastward to the Norwegian coast. On the 13th, the low area appears to have divided into two parts. A well-defined storm-centre appeared off the northern coast of Norway, while an equally well-defined and deep depression formed at the southern limits of the trough. On the 13th, the storm-centre was probably near N. 52°, W. 25°; the bark "Kryolith," in N. 52° 50', W. 21° 45', reported barometer 28.99 (736.3), wind s., force 6, raining; the s. s. "Indiana," in N. 51° 18', W. 21° 06', barometer 29.07 (738.4), wind w., force 6, cloudy; bark "Von Berg," in N. 52° 30', W. 30° 00', fierce e., gale; the s. s. "Germanic," in N. 48° 37', W. 29° 08', barometer 29.00 (736.6), wind n., force 7; the ship "Gordon," in N. 48°, W. 22°, encountered fierce s. gale. During the day, the storm-centre moved toward the British coasts and on the 14th was over Ireland. This depression is hereafter described as low area xxii. of the storms appearing over Europe.

V.—This storm developed probably near the Alaskan coast, where there was a rapid barometric fall on the 4th and 5th, while a corresponding decrease of pressure occurred in Washington territory and in Manitoba, as the centre passed, by a southeasterly course, through the Saskatchewan valley. On the morning of the 8th, the centre was in northern Dakota, whence it moved southward to northern Texas. It was central there on the 9th. The course then changed to northeasterly, and, on the morning of the 10th, the depression was central in Iowa, the barometer at Keokuk reading 29.37 (746.0), a fall of .53 inch in twenty-four hours. On the 11th, the storm-centre was in northern Michigan, here it was attended by severe gales in the lake region and along the New England coast. Moving eastward from Michigan, the centre reached the Gulf of Saint Lawrence on the 12th, causing strong westerly gales along the valley of the Saint Lawrence and in the gulf. On the 13th, the storm moved over the Atlantic and was central probably southeast of Newfoundland, the s. s. "Anchoria," in N. 42°, W. 61°, reporting heavy w. gale with high sea. On the 14th, the s. s. "Köln," in N. 47° 19', W. 41° 35', reported barometer 29.71 (754.6), wind wsw., force 6 to 9, heavy rain and hail. During the 14th, the depression appears to have moved rapidly eastward, and on the 15th was central probably near N. 55°, W. 20°, the s. s. "Lamperts," in N. 53° 15', W. 19° 25', reporting barometer 29.10 (739.1), wind wsw., force 8, and

the s. s. "Illinois," in N. 51° 17', W. 19° 09', barometer 29.24 (742.7), wind ssw., force 6, overcast. During the 15th the disturbance moved, with increasing energy, toward the British coasts; it was central here on the 16th as a very severe storm. The subsequent course of this depression is hereafter described as low area xxiii. of this chart.

VI.—This area developed in Manitoba on the 14th, and, moving southeastward, was central in Minnesota on the morning of the 15th. After crossing Lake Michigan, the course changed to the northeast, and the disturbance moved with increasing pressure toward Ontario, where, on the 16th, it ceased to exist as a depression.

VII.—This depression formed in the Saint Lawrence valley on the 18th and passed rapidly across the Gulf, it appeared as a severe storm, southeast of Newfoundland on the 19th. The s. s. "Ethiopia," in N. 45° 16', W. 52° 24', reported barometer 29.59 (751.6), wind sw., force 6, squally; and the s. s. "Indiana," in N. 46° 00', W. 50° 20', 29.42 (747.3), wind wsw., force 7. On the morning of the 20th, the storm-centre was probably near N. 52°, W. 35°; the s. s. "Baltic," in N. 49° 55', W. 32° 05', reported barometer 29.40 (746.7), wind wsw., force 6, squally, and the s. s. "Jan Breydel," in N. 50° 20', W. 28° 28', encountered heavy sw. gales with high seas. The easterly movement of this depression appears to have been prevented by an area of high pressure, which occupied western Europe and the British Isles on the 21st. Owing to the presence of this high pressure, and to the existence of an area of relatively high pressure in the rear of the disturbance, steep gradients were formed over mid-ocean, and vessels from the region lying between the twenty-fifth and forty-fifth meridians and north of the fiftieth parallel, reported moderate to strong s., se. and w. gales, with high cross seas and squally weather. The s. s. "Pereire" reported stormy weather from the 23d to the 27th, the barometer rising and falling with remarkable rapidity. On the 22d, the pressure remained low over Iceland, and the area under consideration became merged probably in an extensive depression—low area viii.—which was rapidly spreading eastward over the ocean.

VIII.—This depression appeared first east of the Rocky mountains on the 18th. It was probably a continuation of the storm that developed in the Pacific ocean on the 15th, and which is hereafter given as low area xxviii. During the 19th and 20th, the disturbance moved northeastward rapidly, and was central over the eastern part of Lake Superior on the morning of the last-mentioned date. On the 21st, the storm-centre, passing through Ontario, reached the Gulf of Saint Lawrence; it was attended by severe westerly and southwesterly gales on the lakes. On the 22d, the depression, having crossed Newfoundland, was central probably near N. 52°, W. 48°; the s. s. "Roxburgh Castle," in N. 45°, W. 53°, reported increasing gale, terrific squalls, wind veering from s. to w.; the ship "Summer Cloud," in N. 47° 26', W. 47° 24', reported terrific gale; the s. s. "Ohio," in N. 47° 51', W. 46° 58', barometer 29.56 (750.8), wind wnw., force 8, cloudy. The storm-centre apparently moved north-northeastward, and on the 23d, was near N. 57°, W. 40°; the s. s. "State of Florida," in N. 55°, W. 24°, reported fresh sw. gale, squally; the s. s. "Cimbria," in N. 50°, W. 33°, heavy sw. to w. storm, high westerly sea; the s. s. "Ohio," in N. 49° 13', W. 39° 32', wind wnw., force 9, cloudy. On the 24th, the centre of lowest pressure was probably southeast of Greenland, at some distance from the coast, the pressure at Godthaab, Greenland, being 28.74 (730.0), wind nne., force 2; and at Stykkisholm, Iceland, the pressure was 28.78 (731.0), wind s., force 4. The s. s. "State of Florida," in N. 54°, W. 30°, encountered fresh wsw. gales and squally weather; the s. s. "Abyssinia," in N. 51°, W. 25°, strong w. gales, hard squalls and heavy sea; the s. s. "Cimbria," in N. 49°, W. 34°, hurricane-like storm, wind w. to s., tremendous sea. On that day the isobar of 30.00 (762.0) covered the fortieth parallel, showing a gradient corresponding to 1.2 inches to 1,000 miles. Numerous reports from vessels in mid-ocean, from the 23d to the

26th, agree as to the stormy character of the weather over the Atlantic during these days; hurricane-like winds prevailed mostly from southwest and northwest; precipitation was heavy and frequent, and occasionally in the form of hail and snow. On the 25th, the centre of disturbance was south of Iceland, the gradients having increased in the eastern quadrants; strong southwest winds and rain prevailed over the northern parts of the British Isles, and in Scandinavia, the winds were southerly and southeasterly. During the 25th, the depression moved in a southeasterly course, and, on the 26th, was shown over the Hebrides, lowest reported pressure, 28.35 (720.1), at Monach light-house, wind sw., force 8. The barometric gradient had rapidly increased over the northern part of the British Isles, and strong southwesterly gales, with higher temperature and with general rains, prevailed over those islands. On the 27th, the disturbance was central, with increasing pressure, off the coast of Norway, and the barometer rose rapidly over the British Isles, and over northern France and Germany; this rise was accompanied by a slight fall in temperature, but by no general change in the direction of the wind. On the 28th, the depression, moving northeastward, disappeared finally to the north of the White sea. The remains of this depression, probably reinforced by low area xxvii., continued with more or less violence over the Atlantic until the morning of the 29th.

IX.—This depression developed probably in Manitoba on the 27th, and moving eastward, was central near Moose Factory on the 28th, barometer 29.76 (755.9), being a fall of .30 inch in twenty-four hours. On the 29th, the centre passed north of the stations of observation, and on the 30th, it united probably with low area x.

X.—This disturbance formed apparently off the New England coast on the 29th, and was first observed by the s. s. "Pennsylvania," in N. 41° 06', W. 64° 33', barometer 29.55 (750.6), wind nw., force 5, overcast. The s. s. "Britannic," in N. 41° 16', W. 61° 09', reported barometer 29.88 (758.9), wind sse., force 6, raining. On the 30th, the depression was central near N. 45°, W. 45°, the s. s. "Leipzig," in N. 45° 55', W. 43° 03', reporting barometer 29.36 (745.7), wind ssw., force 4.; s. s. "Scythia," in N. 43° 36', W. 51° 46', barometer 29.41 (737.0), wind w., force 4.

XI.—This depression developed probably in the Saskatchewan valley on the 29th, and on the 30th, appeared in Montana. The subsequent course of this depression will be described in the next issue of this REVIEW.

Of the storms appearing over Europe, the following descriptions are given:

XII.—At the close of October, an area of low-pressure occupied northern Europe, and on November 1, the centre of lowest pressure appeared to be over the White sea; barometer at Archangel 29.25 (742.9), wind ese. On the 2d, the depression disappeared to the northward over the Arctic ocean.

XIII.—This depression appeared on the 2d, with its centre near the Gulf of Finland, causing strong northwest winds over Sweden and the Baltic sea. On the 3d, the disturbance moved northeastward, attended by light snow-falls, and finally disappeared over the White sea.

XIV.—This disturbance appeared on the Bay of Biscay on the 2d, and moved eastward, causing a marked barometric fall over France. On the 3d, the storm-centre was over the Mediterranean, off the eastern coast of Spain. Slightly lower temperatures, with northeast winds and cloudy weather, prevailed over France, while in Spain, the wind was northwest, with cloudy and rainy weather. On the 2d, a terrific hurricane passed over the island of Cyprus, causing much destruction of property. On the 4th, the disturbance finally disappeared over Italy, attended by a rapid increase of pressure in its rear.

XV.—This depression appeared off the northwestern coast of Norway on the 3d. It was attended by higher temperature, and by light rain or snow. On the 4th, the centre was northeast of the Gulf of Bothnia. An area of high barometer at this time occupied the British Isles, Denmark, and central Europe,

and a somewhat steep barometric gradient was formed over the Baltic, causing strong southwesterly gales. On the 5th, the disturbance passed eastward and disappeared north of the White sea.

XVI.—On the morning of the 6th, a somewhat deep depression, 29.20 (741.1), appeared off the Norwegian coast, causing a decrease of pressure over the northern parts of the British Isles. It was attended by a general rise in temperature and by rainy weather, with brisk to strong south to west winds. On the 7th, the disturbance moved eastward and was central in northern Sweden. It was attended by rain and snow, and by a considerable rise in temperature. On the 8th, the centre was probably in Finland. The course appears to have then changed to the southeast, and the depression is shown near, and to the east of the Gulf of Finland on the 9th, with strong westerly and northwesterly winds on the east and south of the centre. On the 10th, the disturbance disappeared north of Kansas.

XVII.—This area appeared north of Scotland on the 9th, causing a rapid decrease of pressure over the northern part of Great Britain. A steep barometric gradient was formed over the islands, and strong westerly and southwesterly gales, accompanied by rain in the northern sections of the country, prevailed. The depression moved by a southeasterly course over the North sea, and on the 10th, was central in Denmark. On the 11th, the depression filled up, in northeastern Germany, an area of high pressure, 30.20 (767.1), having then spread over central Europe.

XVIII.—This slight depression appeared near the western shore of the Black Sea on the 10th, and was probably an offshoot of low area xvii., just described. Rain and snow fell in the Black sea districts during the 10th and 11th, and on the 11th, the disturbance filled up near the eastern limits of the Black sea.

XIX.—This was a slight disturbance, which appeared over the Mediterranean on the 12th, and, moving eastward, disappeared on the following day.

XX.—An area of low-pressure appeared near Iceland on the 11th, the barometer having fallen .44 inch at Stykkisholm, wind changing to southeasterly, with snow. A decrease of pressure set in over Scotland on the 11th, and on the 12th, the disturbance presented the form of an extended trough resting off the northwestern coasts of the British Isles and Norway. On the 13th, the depression passed northeastward and merged probably with low area xxi.

XXI.—On the morning of the 13th, an extensive area of low barometer occupied northwestern Europe; the region of lowest pressure was situated in northern Scandinavia, while another deep depression was over the Atlantic ocean, between N. 50° and 60° and W. 20° and 30°. Strong southwesterly gales, accompanied by higher temperatures and rainy weather, prevailed over this district. On the 14th, the centre moved apparently southeastward, and was in Finland; the course then changed to northeasterly, and the depression moved over the White sea, finally disappearing, on the 16th, over the Arctic ocean.

XXII.—This depression is a continuation of low area iv. of the present chart, and is traced from the Gulf of Mexico across the Atlantic to the European coasts. Central on the morning of the 13th, near N. 52°, W. 25°, the disturbance moved eastward, and on the 14th, was central in Ireland; it was accompanied by strong southwesterly winds and rain. On the 15th, the disturbance passed over the North sea, and, on the 16th, was central in southern Scandinavia. It then moved northeastward and became merged probably in an extensive and deep depression occupying Finland and northern Russia. The maximum temperatures of the month occurred in western Europe in connection with this and the preceding area.

XXIII.—This depression is a continuation of the storm traced across the Atlantic as low area v. It appeared off the coast of Ireland, when low area xxii. was crossing the North sea, and, on the 16th, was central over the Irish Channel, attended by a



general rise in temperature, and by rainy weather. Strong northerly winds prevailed over Ireland. In France and in the southern part of England, southwesterly gales occurred, while to the east and north of the centre the winds were generally easterly. On the 17th, the centre of disturbance reached southern Scandinavia, the winds changing to fresh northwesterly over the British Isles, and to strong southwesterly along the shores of the Baltic and the northwestern coasts of Germany. On the 18th, a rapid increase of pressure occurred, and the storm-centre, moving northeastward, on the 19th, crossed the Gulf of Bothnia into Finland. On the 20th, the centre of disturbance appeared near to, but east of, the Gulf of Finland, and on that day united with low area xxiv., which had passed northeastward through northwestern Europe as a somewhat severe storm.

XXIV.—This storm first appeared as a deep depression southwest of the British Isles on the 18th; the s. s. "Nederland," in N.  $49^{\circ} 08'$ , W.  $12^{\circ} 00'$ , reported barometer 28.92 (734.6), wind ne., force 6, stormy. At Scilly, the barometer read 28.70 (729.0), wind ne., heavy gale; and southwesterly gales prevailed on the Spanish coasts and over the Bay of Biscay. The depression moved northeastward, and on the 19th, was central, with increased energy, in Germany, near the mouth of the Elbe, causing strong southwesterly to northwesterly gales, and accompanied by rain and snow. During the 19th, the storm moved rapidly northeastward and crossed the Baltic, attended by strong northerly gales and by rain and snow. On the 20th, the centre appeared in northwestern Russia, where it united with the preceding depression (low area xxiii.). During the 21st and 22d, the disturbance moved eastward, with increasing pressure at the centre, and disappeared finally in the neighborhood of the Ural mountains on the 22d. This storm was very severe in northern France; several houses were unroofed, and numerous vessels in the ports of Havre and Brest sustained more or less damage. At various places in northern Germany, the precipitation accompanying the storm caused much injury to farming interests; several houses were unroofed by the high winds.

XXV.—This depression was slight, 29.80 (718.9). It appeared north of Scotland on the 19th, but was quickly dissipated on the following day by an area of high-pressure, 30.20 (767.1), which covered the British Isles.

XXVI.—This depression appeared in northwestern Russia on the 24th, and, moving eastward, disappeared on the following day in the valley of the Obi.

From the 23d to the 27th, an extensive area of low-pressure covered western Europe, and is described in connection with low area viii.

XXVII.—This area appeared on the 28th, as a deep depression southeast of Iceland, and, moving northeastward, was central off northern Norway on the 29th. On these days there was a decrease of pressure over Ireland and Scotland, which was accompanied by fresh to strong southwesterly winds, and by rain there, and in Scandinavia. On the 30th, the disturbance was central near the White sea, and was attended by snow and strong westerly winds over the Baltic and the Gulf of Bothnia.

XXVIII.—This depression was observed in the Pacific ocean on the 15th, H. M. S. "Gannet," in N.  $34^{\circ}$ , W.  $147^{\circ}$ , reporting barometer 29.62 (752.3) wind ese., force 7 to 9, raining. On the 16th, the ship "Thirlmere," in N.  $39^{\circ} 15'$ , W.  $133^{\circ} 03'$ , encountered strong ne. gale, lasting twelve hours, and the ship "Johanna Heinrich" was abandoned, when about two hundred and fifty miles from San Francisco, during a gale that occurred on the 16th, and increased to a hurricane on the 17th. On the 17th, the centre reached the continent, and, moving eastward during the 18th, was united probably with low area viii. on the 19th.

The following descriptions are given of the storms appearing over eastern Asia:

XXIX.—This depression appeared near Pekin on the 2d, the barometer at that station reading 29.74 (755.3), the wind hav-

ing changed from nw. thirty-one miles per hour to calm, and on the following day to northeasterly. The disturbance moved across the Gulf of Pe-Chi-Li and the peninsula of Corea as a severe storm, the wind at Cape Shan-Tung reaching a velocity of sixty miles, nw. On the 3d, the depression disappeared over the Sea of Japan.

XXX.—This storm probably developed in Tartary on the 6th, a severe snow storm occurring at Vladivostok on that day. On the 7th, the disturbance was over the Sea of Japan, to the northwest of Nippon; on the 8th, the centre was in N.  $36^{\circ}$ , E.  $145^{\circ}$ , the s. s. "City of Peking," in N.  $32^{\circ} 54'$ , E.  $144^{\circ} 11'$ , reporting barometer 29.94 (760.5), a fall of .14 inch, wind wnw., force 6. On the 9th, the area disappeared in the Pacific.

XXXI.—This depression occurred in the Gulf of Pe-Chi-Li, on the 25th, and was extremely violent during its prevalence. At Cape Shan-Tung, a northerly wind of force 10 was reported, accompanied by a heavy snow storm. Moving northeasterly over the Japan sea, the disturbance was central off Nippon on the 26th, the barometer at Tokio 29.59 (751.6), wind sw. On the 27th, the centre passed the northern part of Nippon, the barometer at Sirija-Saki light-house, reading 29.09 (737.0), wind se. to nw. and n. On the same day, the s. s. "Belgie," in N.  $36^{\circ} 26'$ , E.  $146^{\circ} 41'$ , reported barometer 29.46 (748.3), wind w., force 6, high sea; the depression then moved northeastward, and probably reached the Aleutian Islands on the 29th. The Signal Service observer at Attu Island (N.  $52^{\circ} 28'$ , E.  $172^{\circ} 30'$ ), reported: 29th, barometer (not reduced to sea-level) 28.68 (728.5), wind e., fifty-seven miles, raining; and, on the 30th, barometer 28.87 (733.3), wind se., forty-six miles, heavy rain.

The following descriptions of the typhoons of November, 1880, are taken from the "Bulletin Mensuel," published by Mr. Marc Dechevens, of Zi-Ka-Wei, China:

1. This was the last typhoon of the season of 1880 that occurred in the China sea, and was also the most southerly. The s.s. "Ancona" reported: 7th, in N.  $8^{\circ} 30'$ , E.  $110^{\circ} 00'$ , strong nne. wind, high sea; 8th, barometer 30.12 (765.0), wind blowing in squalls and accompanied by heavy rain; on the 9th, the wind was northerly and increasing in force; in N.  $11^{\circ} 07'$ , E.  $112^{\circ} 49'$ , the barometer began to fall and the wind increased. The course was changed and the vessel's head was put southward; at 4 p. m., the wind shifted to northwesterly; it was accompanied by torrents of rain; at 5 p. m., the barometer read 29.70 (754.4), falling, and the wind again shifted to n. and ne.; at 8 p. m., the barometer read 29.60 (751.8), wind ene., the centre passing south of the vessel; at 9 p. m., the barometer began to rise, with clearing weather, and the vessel resumed her course.

During the 12th, 13th, and 14th, the typhoon passed into the Gulf of Siam, where the American bark "Coringa," was wrecked on the 14th. The "Coringa" reported: left Bangkok on the 11th, with strong ne. winds, which continued until the 13th, when it increased to a strong gale. The vessel shipped large quantities of water and sprung a leak, and the bulwarks and boats were lost. The gale continued until the 15th, when, at 4 p. m., wind ene., the vessel was driven ashore near Cape Patani.

2. This typhoon occurred over the ocean at a considerable distance from the coasts. It was first observed in about N.  $23^{\circ}$  and between E.  $130^{\circ}$  and  $150^{\circ}$ . The German ship "Gesine Brons," reported: 15th, barometer 28.88 (733.5), wind sse, veering to sw. and nw.

The typhoons of the season of 1880 ended with the disturbance above mentioned. Thirteen typhoons were observed during the period between July 13th and November 15th, an average of one typhoon every ten days.

#### TEMPERATURE OF THE AIR.

The distribution of mean temperature, over the United States and Canada, for the month of October, 1882, is exhibited on chart ii., by the dotted isothermal lines. The table of mean comparative temperatures in the lower left-hand corner of the chart, shows the average temperature for the month in the

several districts, as determined from observations taken at Signal Service stations during the month of October in previous years.

West of the Rocky mountains, and in the northern and southern slopes, the temperature is below the normal, the departures ranging from 0°.5 in the north Pacific coast region to 6°.9 in the middle plateau. In all other districts, the temperature is above the normal, the greatest departure, 4°.8, occurring in the upper lake region and the upper Mississippi valley. Along the Atlantic coast, the departures vary from 1°.2, in Florida, to 4°.1, in the middle Atlantic states. From the Rio Grande valley northeastward to the lower lake region, the departures are from 1°.7 to 4°.7, the smallest departure occurring in the Rio Grande valley, and the greatest in Tennessee.

#### DEVIATIONS FROM MEAN TEMPERATURE.

Under this heading, departures exhibited by the reports, from the regular Signal Service stations, are shown in the table of comparative temperatures on the left of chart ii. The following items of interest in connection with this subject are reported by voluntary observers:

*Illinois:* Anna, mean temperature, 64°.9, or 5°.25 above the October average of the past seven years. Riley, mean temperature, 53°.1, or 6°.3 above the October average of the past twenty-one years. The minimum temperature for October, 1882, (34°) is higher than that for any corresponding month during the same period.

*Indiana:* Logansport, mean temperature, 57°.4, or 4°.5 above the October average of the past twenty-three years. During that period the highest October mean, 59°.5, occurred in 1881; the lowest, 42°.5, occurred in 1869; the highest maximum temperature, 92°, occurred in 1879; and the lowest minimum, 12°, occurred in 1869. Laconia, month has been remarkably mild, and the mean temperature, 61°.9, is considerably above the October average. Saint Meinrad, mean temperature, 62°.7, or 5°.8 above the October average of the past seven years.

*Iowa:* Clinton, mean temperature, 53°.8, is slightly above the October normal.

*Kansas:* Lawrence, mean temperature, 58°.54, or 4°.11 above the October average of the past fourteen years. During that period, the highest October mean, 60°.46, occurred in 1879; the lowest, 44°.75, occurred in 1869. Wellington, mean tem-

Table of Comparative Maximum Temperatures for the Month of October.

State or Territory.	Maximum for October, 1882, Signal Service.		Highest since Signal Service stations were opened—3 to 11 years.			Highest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of Record.
Alabama	Mobile	87	Montgomery	92	1879	Mount Vernon Arsenal	96	1881	31 years
Arizona	Phoenix	99	Stanwix	103	1876	Fort McDowell	108	1881	15 "
Arkansas	Fort Smith	88	Little Rock	90	1881	Little Rock	90	1881	37 "
California	Los Angeles	89	Los Angeles	96	1879	Fort Yuma	103	1881	31 "
Colorado	Denver	76	Denver	85	'76 & '77	Fort Lyon	92	1881	19 "
Connecticut	New Haven	75	New Haven	86	1881	Columbia	88	1881	9 "
Do						New Haven	83	1881	87 "
Do						Fort Trumbull	77	1881	47 "
Dakota	Yankton	82	Fort Buford	95	1879	Fort Buford	96	1881	9 "
Delaware	Delaware Breakwater	76	Delaware Breakwater	84	1881	Fort Delaware	88	1881	44 "
Dist. of Columbia	Washington	81	Washington	92	'79 & '81	Washington	90	1881	45 "
Florida	Key West	89	Key West	91	'75 & '77	Fort King	99	1881	10 "
Georgia	Augusta	84	Augusta	90	1881	Augusta Arsenal	92	1881	45 "
Idaho	Fort Lapwai	68	Boise City	85	'79 & '80	Fort Boise	95	1881	16 "
Illinois	Chicago	82	Chicago	88	1881	Chicago	90	1881	47 "
Do			Springfield	88	1879	Manchester	90	1881	10 "
Indiana	Indianapolis	79	Indianapolis	86	1879	Vevay	96	1881	15 "
Indian Territory	Fort Supply	88	Fort Sall	91	1878	Fort Sall	96	1881	10 "
Do						Fort Gibson	95	1881	52 "
Iowa	Keokuk	82	Keokuk	87	1879	Muscatine	87	1881	27 "
Kansas	Dodge City	87	Dodge City	89	1881	Fort Larned	98	1881	14 "
Do			Leavenworth	89	1874	Fort Leavenworth	94	1881	50 "
Kentucky	Louisville	82	Louisville	88	1879	Chilesburg	88	1881	3 "
Do						Newport Barracks	85	1881	28 "
Louisiana	Shreveport	80	Shreveport	94	1881	New Orleans	96	1881	50 "
Maine	Portland	74	Portland	83	'79 & '81	Brunswick	88	1881	52 "
Maryland	Ocean City	79	Baltimore	89	'79 & '81	Fort Washington	92	1881	37 "
Massachusetts	Boston	83	Boston	90	1881	Topsfield	87	1881	5 "
Michigan	Port Huron	80	Marquette	87	1879	Monroe	89	1881	10 "
Do						Ontonagon	89	1881	11 "
Minnesota	Saint Paul	80	Breckenridge	89	1879	Fort Snelling	90	1881	61 "
Mississippi	Vicksburg	88	Vicksburg	91	1879	Vicksburg	90	1881	4 "
Do						Columbus	89	1881	9 "
Missouri	Saint Louis	86	Saint Louis	90	1879	Albiontown	100	1881	3 "
Montana	Glendive	82	Fort Custer	87	1879	Fort Shaw	91	1881	8 "
Nebraska	Omaha	80	North Platte	89	1879	Fort McPherson	102	1881	14 "
Nevada	Pioche	69	Winnemucca	84	1879	Fort Ruby	101	1881	5 "
New Hampshire	Mount Washington	58	Mount Washington	57	'77 & '79	Auburn	88	1881	6 "
Do						Fort Constitution	79	1881	33 "
New Jersey	Little Egg Harbor	80	Sandy Hook	89	1879	Vincennes	92	1881	7 "
New Mexico	Fort Bayard	76	La Mesilla	96	1879	Fort Cummings	106	1881	4 "
New York	Rochester	80	New York City	88	'79 & '81	Poughkeepsie	95	1881	20 "
North Carolina	Hatteras	86	Kittyhawk	90	1881	Fort Johnston	90	1881	54 "
Do	Life-saving Station No. 6	86				Weldon	92	1881	6 "
Ohio	Cleveland	80	Toledo	88	1877	College Hill	90	1881	56 "
Do	Columbus	80	Umatilla	86	1880	Marietta	88	1881	33 "
Oregon	Umatilla	68	Pittsburg	91	1879	Fort Dalles	100	1881	16 "
Pennsylvania	Pittsburg	81				Milton	95	1881	2 "
Do						Philadelphia	88	1881	112 "
Rhode Island	Newport	82	Newport	81	1879	Carlisle Barracks	89	1881	34 "
South Carolina	Charleston	83	Charleston	89	1881	Providence	85	1881	35 "
Do						Charleston	89	1881	104 "
Tennessee	Memphis	88	Knoxville	96	1879	Fort Moultrie	88	1881	27 "
Texas	Eagle Pass	95	Rio Grande City and Uvalde	105	1877	Glenwood College	88	1881	10 "
Utah	Salt Lake City	67	Salt Lake City	83	1876	Fort McIntosh	104	1881	25 "
Vermont	Burlington	76	Burlington	78	1879	Fort Douglas	94	1881	18 "
Do						Lunenburg	89	1881	15 "
Virginia	Norfolk	81	Fort Whipple	90	1879	Woodstock	83	1881	6 "
Do						Fortress Monroe	89	1881	54 "
Do						Accotink	91	1881	6 "
Washington T'y	Dayton	67	Dayton	92	1880	Mount Solon	91	1881	6 "
West Virginia	Morgantown	74	Morgantown	85	1879	Fort Walla Walla	88	1881	10 "
Do						Helvetia	86	1881	4 "
Wisconsin	Madison	78	La Crosse and Madison	84	1879	Flemington	86	1881	1 "
Do						Fort Crawford	86	1881	25 "
Wyoming	Cheyenne	75	Cheyenne	80	'74 & '79	Fort Howard	84	1881	30 "
						Fort Laramie	90	1881	26 "



perature, 57°.2, or 0°.2 below the October average of the past three years.

**Maine:** Gardiner, mean temperature, 50°.0, or 2°.61 above the October average of the past forty-six years.

**Maryland:** Fallston, mean temperature, 58°.62, or 3°.37 above the October average of the past twelve years. During that period the highest October mean, 62°.24, occurred in 1879; the lowest, 48°.48, occurred in 1876.

**Missouri:** Saint Louis, the Missouri Weather Service reports the mean temperature to be 61°.2, or 5°.5 above the October normal. This mean was exceeded by the October means of the following years; viz.: 1839, 1852, 1879, and 1881.

**New Hampshire:** Grafton, mean temperature, 47°.8, or 2°.7 below the October average of the past five years. During that period, the highest October mean, 52°.6, occurred in 1877; the lowest, 43°.0, occurred in 1880.

**New York:** Palermo, mean temperature, 49°.0, or 1°.6 above the October average of the past twenty-nine years. During that period, the highest October mean, 53°.9, occurred in 1879; the lowest, 39°.3, occurred in 1873. North Volney, mean temperature, 52°.25, or 3°.34 above the October average of the past fourteen years. During that period, the highest October mean, 55°.5, occurred in 1879; the lowest, 44°.69, occurred in 1876.

**Vermont:** Woodstock, mean temperature 48°.44, or 3°.67 above the October average of the past fifteen years. During that period, the highest October mean, 52°.16, occurred in 1879; the lowest, 39°.16, occurred in 1868; the highest observed temperature, 83°.4, occurred October 1, 1881; the lowest, 10°.5, occurred October 24, 1868.

**Virginia:** Wytheville, mean temperature, 57°.2, or 3°.7 above the October average of a period of eighteen years. Variety Mills, mean temperature, 59°.1, or 0°.5 above the October average of the past five years. During that period, the highest October mean, 61°.2, occurred in 1879; the lowest, 54°.7, occurred in 1880.

**West Virginia:** Helvetia, mean temperature, 56°.1, or 4°.73 above the October average of the past six years, and has been exceeded but once during that period; viz.: in 1881.

#### RANGES OF TEMPERATURE AT SIGNAL SERVICE STATIONS.

The monthly ranges of temperature during October, 1882, have varied from 19° at Key West, Florida, to 69° at Glendive, Montana. The smallest monthly ranges are: Havana, Cuba, 14°; Kingston, Jamaica, and Key West, Florida, 19°; Port Eads, Louisiana, and Block Island, Rhode Island, 25°; Galveston, Texas, and New Orleans, Louisiana, 26°; Cape May, New Jersey, and Punta Rassa, Florida, 27°; Barnegat, New Jersey, Eastport, Maine, Olympia, Washington Territory, and Santa Fé, New Mexico, 28°; Delaware Breakwater, Delaware, Newport, Rhode Island, and Provincetown, Massachusetts, 29°; Narragansett Pier, Rhode Island, Portland, Maine, Portsmouth, North Carolina, and Sandy Hook, New Jersey, 30°. The largest are: Glendive, Montana, 69°; Fort Sully, Dakota, 68°; San Carlos, Arizona, 67°; Cheyenne, Wyoming, and West Las Animas, Colorado, 62°; Tucson, Arizona, 60°; El Paso, Texas, and Fort Supply, Indian Territory, 59°; Dodge City, Kansas, and Phoenix, Arizona, 58°; Fort Apache, Arizona, 57°; Graham, Texas, and Huron, Dakota, 56°; Fort Washakie, Wyoming, Fort Stockton, Texas, and Terry's Landing, Montana, 55°.

The greatest daily ranges of temperature have varied in the different districts, as follows:

**New England:** From 14° at Block Island, Rhode Island, on the 2d to 31° at Springfield, Massachusetts, on the 4th.

**Middle Atlantic states:** From 16° at Cape May, New Jersey, on the 27th to 30° at Williamsport, Pennsylvania, on the 15th, and at Lynchburg, Virginia, on the 16th.

**South Atlantic states:** From 18° at Hatteras, North Carolina, on the 9th, and 24th, and at Portsmouth, North Carolina, on the 10th to 33° at Augusta, Georgia, on the 26th.

**Florida peninsula:** From 14° at Key West on the 7th to 19° at Cedar Keys on the 25th.

Table of Maximum and Minimum Temperatures for October, 1882.

State or Territory.	Signal Service.			U. S. Army Post Surgeons, or Voluntary Observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
Alabama.....	Mobile.....	87	33	Calera.....	92	0
Do.....	Montgomery.....	86	49	Tuscaloosa.....	90	30
Arizona.....	Phoenix.....	99	41			
Do.....	Fort Apache.....	81	24	Madison.....	93	28
Arkansas.....	Fort Smith.....	88	42	Mammoth Tank.....	112	63
California.....	Los Angeles.....	89	44	Borden.....	100	48
Do.....	Red Bluff.....	82	37	Berryvale.....	74	22
Do.....				Fort Bidwell and Summit.....	24	
Colorado.....	Denver.....	76	27	Fort Lyon.....	89	20
Do.....	Pike's Peak.....	37	5	Pagosa Springs.....	70	6
Connecticut.....	New Haven.....	75	37	Southington.....	78	29
Dakota.....	Yankton.....	82	30	Wicklow.....	86	28
Do.....	Fort Meade.....	68	17	Fort Sisseton.....	71	17
Delaware.....	Del. Breakwater.....	76	47	Receiv'g Reservoir.....	82	40
District of Columbia.....	Washington.....	81	43	West Washington.....	78	38
Florida.....	Key West.....	89	71	Fort Brooke.....	91	57
Do.....	Jacksonville.....	86	51	Live Oak.....	91	41
Georgia.....	Augusta.....	84	43	Way Cross.....	91	32
Do.....				Madison.....		
Idaho.....	Fort Lapwai.....	68	26			
Do.....	Eagle Rock.....	67	22	Marengo.....	89	37
Indiana.....	Indianapolis.....	79	36	Rushville.....	80	25
Do.....				Bunker Hill and Charleston.....	86	36
Illinois.....	Cairo.....	82	45	Elmira.....	83	30
Do.....	Champaign.....	79	38	Fort Madison.....	86	23
Indian Territory.....	Fort Supply.....	88	29			
Iowa.....	Keokuk.....	82	38	Clay Centre.....	90	28
Do.....	Dubuque.....	78	30	Topeka.....	83	22
Kansas.....	Dodge City.....	87	29	Frankfort.....	79	39
Do.....				New Iberia.....	95	
Kentucky.....	Louisville.....	82	41	Morgan City.....	80	37
Louisiana.....	Shreveport.....	89	47	Dexter.....	80	28
Do.....				Orono.....	78	25
Maine.....	Portland.....	74	38	Emmitsburg.....	77	32
Do.....	Eastport.....	64	36			
Maryland.....	Ocean City.....	79	42	Williamstown.....	72	27
Do.....	Baltimore.....	78	44	Otisville.....	80	27
Massachusetts.....	Boston.....	83	39			
Do.....	Springfield.....	74	34	Waynesborough.....	93	
Michigan.....	Port Huron.....	80	34	Hernando.....	87	38
Do.....	Alpena.....	78	29	Protem.....	87	31
Minnesota.....	Saint Paul.....	80	33	Oregon.....	82	30
Do.....	Saint Vincent.....	73	23			
Mississippi.....	Vicksburg.....	88	48	Lincoln.....	99	40
Do.....	Starkville.....	85	47	Fort Niobrara.....	82	22
Missouri.....	Saint Louis.....	86	43	Goconda.....	80	23
Do.....	Springfield.....	82	38	Tecoma.....	66	20
Montana.....	Glendive.....	82	13	Toano.....	62	20
Do.....	New Chicago.....	63	13	New Market.....	79	30
Nebraska.....	Omaha.....	80	35	Grafton.....	74	20
Do.....	North Platte.....	78	28	South Orange.....	82	42
Nevada.....	Pioche.....	69	23	Paterson.....	78	37
Do.....				Vineland.....	74	37
New Hampshire.....	Mt. Washington.....	58	10	Fort Union.....	77	14
Do.....				Beming.....	98	48
New Jersey.....	Little Egg Harbor.....	80	43	Fort Hamilton.....	80	41
Do.....	Atlantic City.....	74	39	North Volney.....	80	30
Do.....				Johnstown.....	78	21
New Mexico.....	Fort Bayard.....	76	26	Wadesborough.....	86	
Do.....	Santa Fé.....	69	25			
New York.....	Rochester.....	80	31	Salisbury.....	33	
Do.....						
North Carolina.....	Hatteras.....	82	48	Portsmouth.....	83	36
Do.....	Life-saving Station No. 6.....	82	49	New Athens.....	74	30
Do.....	Charlotte.....	81	41	Westerville.....	78	30
Do.....	Sloop Point.....	80	41			
Ohio.....	Cleveland.....	80	35	Franklin.....	74	24
Do.....	Columbus.....	80	36	Fort Adams.....	72	41
Do.....						
Oregon.....	Umatilla.....	68	30	Stateburg.....	82	47
Pennsylvania.....	Pittsburg.....	81	36	Allendale, Saint Matthew and Spartanburgh.....	87	
Do.....	Williamsport.....	77	34	Wythe.....	90	31
Rhode Island.....	Newport.....	72	43	Corinth.....	98	
Do.....	Point Judith.....	69	38	Waco.....		
South Carolina.....	Charleston.....	83	62	Blue Creek.....	72	30
Do.....				Ogden.....	70	26
Tennessee.....	Memphis.....	88	48	Charlotte.....	78	26
Do.....	Knoxville.....	84	36	Strafford.....	76	34
Texas.....	Eagle Pass.....	96	45	Woodstock.....	77	20
Do.....	El Paso.....	87	28	Accotink.....	82	46
Utah.....	Salt Lake City.....	67	30	Snowville.....	76	31
Do.....				Bainbridge Island.....	68	38
Vermont.....	Burlington.....	76	28			
Do.....				Helvetia.....	74	28
Virginia.....	Norfolk.....	81	47	Beloit.....	82	31
Do.....	Lynchburg.....	80	44	Neillsville.....	70	24
Washington Ter.....	Dayton.....	67	30	Fort Bridger.....	67	12
Do.....	Colfax.....	60	27			
West Virginia.....	Morgantown.....	74	35			
Wisconsin.....	Madison.....	78	35			
Do.....						
Wyoming.....	Cheyenne.....	75	13			

East Gulf states: From 16° at New Orleans, Louisiana, on

the 25th to 26° at Vicksburg, Mississippi, on the 15th and 24th, and at Montgomery, Alabama, on the 25th.

*West Gulf states:* From 14° at Galveston, Texas, on the 16th to 35° at Fredericksburg, Texas, on the 23d, and 37° at Fort Smith, Arkansas, on the 24th.

*Rio Grande valley:* From 37° at Eagle Pass, Texas, to 38° at Uvalde, Texas, on the 24th.

*Ohio valley and Tennessee:* From 26° at Morgantown, West Virginia, on the 25th, and 27° at Memphis, Tennessee, on the 12th and 21st to 35° at Knoxville, Tennessee, on the 25th.

*Lower lake region:* From 25° at Toledo, Ohio, on the 30th to 34° at Rochester, New York, on the 16th.

*Upper lake region:* From 21° at Chicago, Illinois, on the 31st to 28° at Mackinac City, Michigan, on the 14th, and at Alpena, Michigan, on the 21st.

*Extreme northwest:* From 29° at Saint Vincent, Minnesota, on the 23d to 35° at Fort Stevenson, Dakota, on the 13th.

*Upper Mississippi valley:* From 22° at La Crosse, Wisconsin, on the 26th to 33° at Saint Paul, Minnesota, on the 14th.

*Missouri valley:* From 29° at Springfield, Missouri, on the 24th to 46° at Fort Bennett, Dakota, on the 27th.

*Northern slope:* From 25° at Fort Assiniboine, Montana, on the 28th to 42° at Cheyenne, Wyoming, on the 3th, and 43° at Fort Washakie, Wyoming, on the 13th.

*Middle slope:* From 26° at Pike's Peak, Colorado, on the 18th to 52° at West Las Animas, Colorado, on the 13th.

*Southern slope:* From 28° at Henrietta, Texas, on the 13th, 21st, 23d, and 24th to 42° at Fort Stockton, Texas, on the 24th.

*Southern plateau:* From 31° at Fort Grant, Arizona, on the 16th to 53° at Fort Apache, Arizona, on the 22d and 23d.

*Middle plateau:* From 27° at Salt Lake City, Utah, on the 3d to 40° at Winnemucca, Nevada, on the 4th.

*Northern plateau:* From 27° at Lewiston, Idaho, on the 18th to 37° at Eagle Rock, Idaho, on the 23d.

*North Pacific coast region:* From 19° at Portland, Oregon, on the 22d to 23° at Olympia, Washington Territory, on the 4th.

*Middle Pacific coast region:* From 20° at San Francisco, California, on the 22d to 35° at Red Bluff, California, on the 20th.

*South Pacific coast region:* From 28° at San Diego, California, on the 9th to 36° at Los Angeles, California, on the 9th, and 38° at Yuma, Arizona, on the 24th.

#### FROSTS.

The dates of the occurrence of frosts in the different states and territories are given below. In those states where they were of general occurrence, the dates only are given; where they were not of general occurrence, the stations reporting, with the dates are given:

*California:* 5th, 14th, 15th, 27th, 30th, 31st.

*Colorado:* 1st, 2d, 3d, 5th, 6th, 8th, 10th, 13th, 16th, 17th, 19th, 20th, 22d, 23d, 26th, 27th, 29th, 31st.

*Connecticut:* 4th, 22d, 27th.

*Dakota:* 1st, 4th, 6th to 10th, 13th, 16th to 20th, 22d, 23d, 24th, 26th, 27th, 29th, 30th, 31st.

*Idaho:* 2d, 8th, 10th, 17th to 26th, 30th, 31st.

*Illinois:* 14th, 15th, 17th to 24th, 26th, 29th.

*Indiana:* 12th to 15th, 18th to 24th, 30th.

*Iowa:* 9th, 13th, 16th to 24th, 26th, 27th, 29th, 30th, 31st.

*Kansas:* 12th, 13th, 16th to 31st.

*Maine:* 3d to 6th, 11th, 12th, 13th, 15th, 21st, 22d, 26th, 28th, 29th.

*Maryland:* 20th, 21st, 25th, 26th.

*Massachusetts:* 3d, 4th, 20th, 21st, 22d, 26th, 27th, 28th, 31st.

*Michigan:* 10th, 13th to 21st, 23d to 28th.

*Minnesota:* 9th, 10th, 16th to 20th, 22d to 27th, 29th, 30th, 31st.

*Missouri:* 17th to 20th, 23d, 24th, 27th, 29th.

*Montana:* 2d, 3d, 5th to 10th, 13th to 18th, 20th to 31st.

*Nebraska:* 8th, 9th, 10th, 13th, 16th, 19th, 21st to 24th, 26th, 27th, 29th.

*Nevada:* 2d, 5th, 6th, 8th, 9th, 12th to 23d, 25th to 28th.

*New Hampshire:* 3d, 4th, 11th, 16th, 22d, 23d, 27th, 28th, 31st.

*New Jersey:* 24th to 27th.

*New Mexico:* 8th, 9th, 10th, 12th, 15th to 21st, 23d, 27th to 30th.

*New York:* 1st, 3d, 4th, 9th, 10th, 11th, 14th, 15th, 16th, 20th, 21st, 22d, 25th, 27th, 28th, 30th.

*North Carolina:* 25th.

*Ohio:* 2d, 14th, 15th, 16th, 18th to 30th.

*Oregon:* 3d, 7th, 20th to 26th, 30th.

*Pennsylvania:* 1st to 4th, 10th, 15th, 16th, 20th, 21st, 24th to 28th, 30th, 31st.

*Rhode Island:* 27th.

*Tennessee:* 15th, 21st, 24th, 25th.

*Texas:* 10th, 17th, 19th to 22d.

*Utah:* 3d, 5th, 6th, 9th, 18th to 23d.

*Vermont:* 3d to 6th, 11th, 16th, 21st, 22d, 27th, 28th, 31st.

*Virginia:* 14th, 15th, 25th.

*Washington Territory:* 2d, 3d, 6th, 12th, 16th, 17th, 18th, 20th to 26th.

*West Virginia:* 15th, 16th, 21st, 22d, 25th.

*Wisconsin:* 17th to 21st, 23d, 24th, 26th, 27th, 31st.

*Wyoming:* 3d, 4th, 6th, 8th, 9th, 10th, 12th, 15th to 28th, 30th, 31st.

*Arizona:* Prescott, 26th, 27th, 28th, 31st.

*Arkansas:* Mount Ida, 20th, 21st, 22d.

*Georgia:* Harlem, 18th; Augusta, 25th, in the vicinity.

*Indian Territory:* Fort Supply, 10th, 13th, 19th.

*Kentucky:* Louisville, 24th.

*South Carolina:* Stateburg, 17th, 25th.

Heavy and killing frosts have occurred in all northern districts, but no instances of damage have been reported. Owing to the unusual lateness of frosts which were sufficiently heavy to injure vegetation, all crops which are usually exposed to injury have been harvested. A heavy frost occurred in the western part of the city of San Francisco, on the 31st, killing many of the delicate plants in the Golden Gate Park. No damage has been reported from the southern states.

#### ICE.

The formation of ice occurred in the various states and territories as follows:

*Arizona:* Tucson, 16th; Fort Verde, 19th.

*Colorado:* Pagosa Springs, 6th, 9th, 10th; Fort Lyon, 10th; West Las Animas, 10th.

*Connecticut:* Southington, 27th.

*Dakota:* Wicklow, 18th, 19th, 26th, 27th, 29th, 30th.

*Idaho:* Lewiston, 2d.

*Illinois:* Elmira, 17th, 19th, 20th; Charleston, 20th, 24th, 29th; Polo, 19th.

*Iowa:* Guttenburg, 17th; Independence, 18th, 19th; Muscatine, 19th; Humboldt, 18th; Dubuque, 19th.

*Kansas:* Holton, 19th; Salina, 20th; Pretty Prairie, 18th, 22d; Fort Scott, 29th.

*Maine:* Cornish, 28th; Bangor, 12th, 22d, 28th.

*Massachusetts:* Williamstown, 21st, 28th.

*Michigan:* Grand Haven, 24th.

*Minnesota:* Saint Vincent, 10th; Duluth, 18th, 19th.

*Montana:* Terry's Landing, 6th; Fort Keogh, 30th.

*Nebraska:* Genoa, 13th, 16th, 19th, 22d, 23d, 24th, 26th, 27th, 29th, 31st.

*New Hampshire:* New Market, 22d, 27th, 28th.

*New Mexico:* Santa Fé, 8th, 9th, 10th, 29th.

*New York:* Palermo, 21st; Menand's Station, 21st; Buffalo, 20th, 21st.

*Ohio:* Westerville, 20th, 21st, 25th, 30th; Ruggles, 20th; Columbus, 21st; Toledo, 28th.

*Pennsylvania:* West Chester, 25th.

*Utah:* Salt Lake City, 19th.

*Vermont:* Woodstock, 3d, 4th.

*Virginia:* Wytheville, 24th.



## PRECIPITATION.

(Expressed in inches and hundredths.)

The distribution of rainfall over the United States and Canada, as determined from observations taken at more than six hundred stations, is exhibited on chart iii. The table in the lower left-hand corner of this chart shows the average monthly rainfall, determined from the records of Signal Service stations, in the several districts, and the excess or deficiency as compared with the average of many years.

There has been an excess of rainfall in the south Atlantic states and in Florida, of 1.36 and 0.48, respectively. In the upper lake region and from the Mississippi westward to the Pacific coast, except in the northern slope, Rio Grande valley, and the southern plateau (where there have been deficiencies of 0.25, 0.65, and 0.89, respectively), the rainfall has been above the October average. The largest excess, 4.25, is reported from the north Pacific coast region. In the south Pacific coast region, the excess amounts to 0.10; in the middle Pacific coast region, to 1.86; and in the northern and middle plateau districts, to 1.23 and 0.97, respectively. From the west Gulf states and the southern slope, northward to the extreme northwest, the excesses vary from 0.72 to 1.41. Only a slight excess is reported from the upper lake region. From the east Gulf states, northeastward to New England, except along the south Atlantic coast and in Florida, deficiencies ranging from 0.46 to 1.75 are reported; they are greatest in the Ohio valley and Tennessee, and in the lower lake region. In New England, the middle Atlantic, and east Gulf states, the deficiencies vary from 0.46 to 0.59. On the summit of Pike's Peak, the monthly rainfall was 0.40, or 1.45 below the October average. On the summit of Mount Washington, the monthly rainfall was 6.19, which is 0.55 below the October average.

## DEVIATIONS FROM AVERAGE PRECIPITATION.

Under this heading, departures exhibited by the regular Signal Service stations, are shown in the table of comparative monthly rainfalls, as published in the lower left-hand corner of chart iii. The following items of interest in connection with this subject are reported by voluntary observers:

**Illinois:** Riley, monthly rainfall, 4.17, or 1.68 above the October average of the last twenty-one years, and has been exceeded during that period only in 1877, 1878, and 1881. Anna, monthly rainfall, 2.06, or 2.21 below the October average of the last seven years.

**Indiana:** Logansport, monthly rainfall, 3.07, or 0.55 above the October average of the last twenty-three years. During that period, the largest October rainfall, 6.98, occurred in 1877; the smallest, 0.78, occurred in 1872. Saint Meinrad, monthly rainfall, 2.17, or 0.62 below the October average of last seven years.

**Iowa:** Clinton, monthly rainfall, 2.69, or slightly below the October average.

**Kansas:** Lawrence, monthly rainfall, 3.08, or 0.45 above the October average of the past fourteen years. During that period, the largest October rainfall, 6.96, occurred in 1870; the smallest 0.44, occurred in 1878. The total precipitation for the ten months ending October 31, 1882, is 24.26, or 6.76 below the mean of the corresponding months of the past fourteen years. Wellington, monthly rainfall, 6.32, or 3.13 above the October average of the past three years.

**Maine:** Gardiner, monthly rainfall, 2.02, or 2.48 below the October average of the past forty-six years.

**Maryland:** Fallston, monthly rainfall, 0.79, or 2.80 below the October average of the past twelve years. During that period, the largest October rainfalls, 7.56 and 7.70, occurred in 1873 and 1877, respectively; the least, 0.23 and 0.76, occurred in 1874 and 1879, respectively.

**New Hampshire:** Grafton, monthly rainfall, 1.06, or 2.25 below the October average of the past three years, and is the smallest monthly rainfall that has occurred during that period.

**New York:** Palermo, monthly rainfall, 0.30, or 3.30 below the October average of the past twenty-nine years. During

that period, the largest October rainfall, 7.90, occurred in 1862; the smallest is that of the present year. North Volney, monthly rainfall, 1.20, or 2.84 below the October average of the past ten years, and is the smallest for any October during that period; the largest October rainfall, 6.20, occurred in 1872; the smallest, 1.85, (with the exception of October, 1882), occurred in 1879.

**Virginia:** Wytheville, monthly rainfall, 1.10, or 1.90 below the October average of a period of eighteen years. The total precipitation for the ten months ending October 31, 1882, is 46.59, or 10.00 above the average of the corresponding months of eighteen years. Variety Mills, monthly rainfall, 1.52, or 1.31 below the average of the past four years. During that period, the largest October rainfall, 4.56, occurred in 1878; the smallest, 1.00, occurred in 1880.

**West Virginia:** Helvetia, monthly rainfall, 1.30, or 2.00 below the October average of the past six years.

The following table shows the greatest and least numbers of rainy and cloudy days, and percentages of mean relative humidity, as reported from the various districts:

Table of rainy and cloudy days and relative humidity for October, 1882.

Districts.	Rainy days	Cloudy days.	Relative humidity. *
	From 7 to 14	From 3 to 13	Percentages.
New England.....	7 to 14	3 to 13	From 71.1 to 79.8.
Middle Atlantic states.....	7 to 16	7 to 11	68.4 to 85.8.
South Atlantic states.....	7 to 13	5 to 9	72.4 to 88.0.
Florida peninsula.....	8 to 13	4 to 7	75.8 to 79.1.
East Gulf states.....	6 to 12	3 to 7	71.1 to 80.5.
West Gulf states.....	7 to 12	1 to 7	74.3 to 83.4.
Rio Grande valley.....	5 to 10	4 to 8	63.5 to 71.4.
Ohio valley and Tennessee.....	7 to 13	2 to 8	65.5 to 78.9.
Lower lake region.....	8 to 14	2 to 7	60.4 to 74.0.
Upper lake region.....	8 to 9	3 to 14	71.1 to 76.8.
Extreme northwest.....	11 to 14	5 to 12	72.8 to 80.3.
Upper Mississippi valley.....	7 to 15	4 to 12	66.2 to 78.8.
Missouri valley.....	5 to 12	4 to 8	62.8 to 74.9.
Northern slope.....	1 to 16	1 to 11	44.7 to 66.2.
Middle slope.....	2 to 7	1 to 5	46.7 to 61.7.
Southern slope.....	1 to 9	0 to 5	65.6 to 76.4.
Southern plateau.....	0 to 2	0 to 1	30.3 to 43.8.
Middle plateau.....	5 to 13	1 to 12	46.9 to 59.4.
Northern plateau.....	10 to 23	8 to 18	68.2 to 80.4.
North Pacific coast region.....	21 to 25	14 to 19	78.3 to 85.0.
Middle Pacific coast region.....	8 to 14	2 to 7	65.3 to 85.4.
South Pacific coast region.....	1 to 8	0 to 2	36.7 to 71.0.

\* Relative humidity corrected for altitude.

Table of Excessive, Greatest and Least Monthly Rainfalls.

STATION.	SPECIAL HEAVY.			Largest Monthly.	SMALLEST MONTHLY.	
	Date.	Amt.	Duration	Amount.	STATION.	Amt.
<b>Alabama.</b>					<b>Alabama.</b>	
Mobile.....	31	5.20	5 hrs.	8.29	Talladega.....	0.29
Tuscaloosa.....	19	3.10			Calera.....	0.37
Birmingham.....	19	2.30			<b>Arizona.</b>	
<b>Arkansas.</b>					Casa Grande.....	0.00
Little Rock.....	28, 29	2.97		6.05	Benson.....	0.00
Russellville.....				6.89	Maricopa.....	0.00
Mount Ida.....				6.05	Fort Grant.....	0.00
<b>Canada.</b>					Fort Bowie.....	0.10
Halifax N. S.....				9.13	Pantano.....	0.00
Yarmouth, N. S.....				7.24	San Carlos.....	0.00
<b>California.</b>					San Simon.....	0.00
Summit.....				12.95	Tucson.....	0.00
Fort Gaston.....				9.02	Willcox.....	0.00
Cisco.....				8.29	Fort Apache.....	1.00
Emigrant Gap.....				7.95	Yuma.....	0.01
Alta.....				7.65	Texas Hill.....	0.08
Waugh's Ferry.....				6.50	Phoenix.....	0.10
<b>Florida.</b>					Fort Verde.....	0.25
Fernandina.....	20, 21	13.14		17.17	Prescott.....	0.39
Saint Augustine.....	20 to 23	11.54	64 hrs.	12.71	<b>California.</b>	
Jacksonville.....	20, 21, 22	7.62		10.30	Indio.....	0.00
Maryport.....	20 to 23	7.66		9.07	Mojave.....	0.00
Fort Barrancas.....	13	2.05	3 hrs. 3 m.	8.17	Whitewater.....	0.00
Do.....	19	2.28	6 hrs.		Fresno.....	0.05
Live Oak.....	11	4.75		7.64	Los Angeles.....	0.05
Cedar Keys.....	10, 11	3.50			Ravenna.....	0.12
Pensacola.....	13	2.01	3 hrs. 35 m.		Newhall.....	0.16
<b>Georgia.</b>					Kingsburg.....	0.19
Way Cross.....	11	2.72		6.34	Anaheim.....	0.26
Jesup.....	11	2.78			San Fernando.....	0.28
Quitman.....	11	2.70			Poway.....	0.29
Albany.....	20	2.50			San Diego.....	0.41
Eastman.....	20, 21	3.99			Napa.....	0.44
Alapaha.....	21	5.00			Solidad.....	0.46
<b>Kansas.</b>					Colton.....	0.50
Wellington.....	7	4.18		6.32	Mammoth Tank.....	0.50
Creswell.....	7	3.29		6.15	<b>Colorado.</b>	
Argyle.....				6.22	Pagosa Springs.....	0.00
Levy.....				6.20		

Table of Excessive, Greatest and Least Monthly Rainfalls—Continued.

STATION.	SPECIAL HEAVY.			Largest Monthly.	SMALLEST MONTHLY.	
	Date.	Amt.	Duration	Amount, Inches.	STATION.	Amt.
Milan.....				6.15	Fort Lewis.....	0.20
Pretty Prairie.....				6.15	Fort Lyon.....	0.20
..... Louisiana.	17, 18	4.17		6.72	West Las Animas.....	0.25
Shreveport.....	18	3.07			Fort Garland.....	0.30
Monroe.....	18	2.62			Pike's Peak.....	0.40
Alexandria.....					..... Dakota.	
..... Massachusetts.	14	4.54	9 hrs.	6.30	Smithville.....	0.12
Somersot.....	14	2.19	8 hrs.		Fort Sully.....	0.14
Provincetown.....				7.67	..... Georgia.	
Northport.....					Bainbridge.....	0.33
..... Mississippi.	18	2.09			..... Maryland.	
Vicksburg.....				9.50	Fort McHenry.....	0.26
..... Missouri.				7.81	Ocean City.....	0.42
Pierce City.....				7.62	..... Massachusetts.	
Clinton.....	2	1.50	1hr.35m.	7.22	Rowe.....	0.25
Springfield.....				7.07	Williamstown.....	0.32
Protem.....				6.10	..... Mississippi.	
..... Nebraska.				6.19	Meridian.....	0.20
Nebraska City.....	14	2.05			..... Montana.	
Minden.....	11, 12	7.38		9.45	Fort Custer.....	0.29
..... New Hampshire.	11, 12	7.04		9.03	Terry's Landing.....	0.49
Mount Washington.....	11, 12	4.08		7.57	..... Nebraska.	
..... New Jersey.	2	2.17			Red Willow.....	0.12
Barnegat.....	11, 12	5.70		6.69	..... Neada.	
..... North Carolina.	11, 12	5.26		6.32	Wadsworth.....	0.16
Smithville.....	11, 12	4.30		6.15	..... New Mexico.	
Hatteras.....	19, 20	3.14		6.13	Deming.....	0.00
Wilmington.....	11, 12	4.37			Fort Union.....	0.00
Do.....				11.63	Fort Wingate.....	0.00
Portsmouth.....				7.61	Lordsburg.....	0.00
Fort Macon.....				7.07	Fort Hayard.....	0.00
New River Inlet.....	10	2.93			Santa Fé.....	0.00
Charlotte.....					..... New York.	
Sloop Point.....	14	3.85			Albany.....	0.27
Portland.....	14	2.26			Palermo.....	0.30
..... Rhode Island.	11	4.27	10hr.15m.	6.56	Oswego.....	0.50
Newport.....	10, 11	3.95			..... Texas.	
Block Island.....	20, 21	3.25			El Paso.....	0.00
..... South Carolina.	21	3.00			Wyoming.....	
Charleston.....					Cheyenne.....	0.31
Hardeeville.....	12	1.79	2 hrs.	9.96		
Columbia.....	18, 19	4.35	12hr.45m.			
Jacksonboro.....	6, 7, 8	5.07		8.62		
..... Texas.	16	4.15		7.32		
Palestine.....	18	2.16		7.16		
Do.....	18	2.59		6.79		
Huntsville.....	8	1.70	1hr.10m.			
Dallas.....	15, 16	3.16				
Tyler.....				7.25		
Galveston.....	24	2.68		6.67		
San Antonio.....				6.81		
Houston.....						
..... Virginia.						
Cape Henry.....						
Norfolk.....						
..... Washington Territory.						
Colfax.....						

## HAIL.

The most destructive hail storm of the month passed over eastern Iowa on the afternoon of the 30th, being most destructive in the vicinity of Davenport. A description of this storm is given under LOCAL STORMS. At Davenport, the fall of hail began at 3.21 p. m. and lasted six minutes. During this time, hailstones of various sizes and irregular shapes fell, breaking nearly all of the sky-lights in the city. Pieces of ice were picked up which measured as much as eight and one-half inches, with a thickness of one and a half inches. Hailstones as large as these again fell from 3.40 to 3.43 p. m. This storm is considered to have been the severest that has ever visited this locality.

Burlington, Iowa, 30th: About 5.00 p. m., a terrific hail storm passed over this place. The hailstones were very large; one of them was found to measure five and one-quarter inches in circumference.

Rock Island, Illinois, 30th: A destructive hail storm occurred at 3.30 p. m., lasting ten minutes. The hailstones were very large.

Lincoln, Nebraska, 6th: A heavy storm occurred here at 6.30 p. m., accompanied by hail and lightning, which is a very remarkable occurrence for this season.

Red Bluff, California, 1st: During the storm of this date, hailstones measuring one inch in diameter fell, completely covering the ground.

Fort Supply, Indian Territory: During the night of the 11th-12th, a heavy rain and hail storm occurred twenty miles north of this place.

Hail storms of less violence have been reported as follows:

Arkansas: Little Rock, 12th.

California: Alcatraz Island, 2d.

Dakota: Fort Sully, 3d; Fort Lincoln, 15th, 17th; Fort Yates, 15th.

Illinois: Morrison, 30th.

Iowa: Dubuque, 30th.

Indian Territory: Fort Reno, 7th; Fort Supply, 7th.

Idaho: Lewiston, 14th; Eagle Rock, 16th.

Michigan: Escanaba, 12th; Northport, 29th.

Missouri: Protem, 12th; Pierce City, 28th; Clinton, 27th, 28th, 30th.

New Jersey: Moorestown, 27th.

Oregon: Portland, 10th; Albany, 13th.

Pennsylvania: Fallsington, 27th.

Utah: Coalville, 3d; Salt Lake City, 8th, 12th.

Washington Territory: Dayton, 14th, 30th.

Wisconsin: Madison, 30th.

## SNOW.

Snow fell in the various states and territories as follows:

California: Fort Bidwell, 2d, 3d, 4th, 12th, 14th.

Colorado: Fort Garland, 11th, 17th; Fort Lewis, 10th; Pagosa Springs, 11th; West Las Animas, 17th, 18th; Denver, 11th, 17th, 30th; Pike's Peak, 6th, 7th, 8th, 14th, 15th, 17th, 26th.

Dakota: Fort Abraham Lincoln, 15th, 28th, 29th; Fort Sisseton, 31st; Fort Totten, 26th, 28th; Fort Meade, 15th, 17th; Rapid City, 15th; Fort Buford, 26th; Bismarek, 15th, 30th; Fort Stevenson, 15th, 26th, 29th; Tobacco Garden, 17th, 26th, 29th, 31st; Deadwood, 12th, 15th, 16th, 27th.

Idaho: Eagle Rock, 4th, 14th, 31st; Boise City, 30th.

Michigan: Marquette, 29th.

Minnesota: Fort Snelling, 21st; Duluth, 29th; Moorhead, 17th, 30th; Saint Vincent, 17th, 30th.

Montana: Cartersville, 1st, 2d, 3d, 31st; Fort Keogh, 31; Terry's Landing, 31st; New Chicago, 2d, 3d, 14th, 15th, 17th, 30th, 31st; Fort Ellis, 2d, 3d, 8th, 9th, 13th, 16th, 17th, 31st; Fort Shaw, 2d, 3d, 4th, 21st, 27th, 31st; Deer Lodge, 2d, 5th; Fort Assiniboine, 24th; Fort Benton, 2d, 31st; Fort Custer, 31st; Helena, 2d; Fort Missoula, 30th, 31st.

Nevada: Carson City, 2d, 3d, 5th, 12th, 30th; Winnemucca, 4th, 13th; Pioche, 14th.

New Hampshire: Mount Washington, 24th, 25th, 26th.

New Mexico: Santa Fé, 18th.

Utah: Fort Douglas, 4th, 9th, 12th, 14th; Salt Lake City, 4th, 14th, 15th, 31st.

Washington Territory: Colfax, 29th, 30th, 31st; Pomeroy, 30th, 31st; Dayton, 31st; Spangle, 30th, 31st.

Wyoming: Fort Bridger, 2d, 4th, 5th, 11th, 14th, 16th, 30th, 31st; Cheyenne, 6th, 9th, 17th; Fort Washakie, 14th, 15th.

## LARGEST MONTHLY SNOWFALL.

[Expressed in inches.]

The following are the largest monthly snowfalls reported during the month:

Summit, California, 27 $\frac{1}{2}$ ; Cisco, California, 13 $\frac{1}{2}$ ; Wells, Nevada, 10 $\frac{1}{2}$ ; Coalville, Utah, 9 $\frac{1}{2}$ ; Otego, Nevada, 8 $\frac{1}{2}$ ; Toano, Nevada, 7 $\frac{1}{2}$ ; Emigrant Gap, California, 6; Promontory, Utah, 3 $\frac{1}{2}$ ; Halleck, Nevada, 3.

DEPTH OF UNMELTED SNOW ON GROUND AT END OF THE MONTH.

[Expressed in inches.]

Saint Vincent, Minnesota, 2; Fort Custer, Montana, 2; Helena, Montana,  $\frac{1}{2}$ ; Fort Shaw, Montana,  $\frac{1}{2}$ . On the summits of Pike's Peak, Colorado, and Mount Washington, New Hampshire, trace.

## SLEET.

Cheyenne, Wyoming, 9th; Fort Ellis, Montana, 11th; Colfax, Washington Territory, 14th.



## COTTON REGION REPORTS.

The following table gives the average rainfall, mean of the maximum and mean of the minimum temperatures, in each of the cotton districts, as shown on the chart issued with the April Review.

*Meteorological Record of the Cotton Districts for the month of October, 1882.*

DISTRICTS.	Average rainfall in inches.	Mean of the maximum.	Mean of the minimum.
New Orleans.....	2.64	81.9	62.0
Savannah.....	4.95	86.0	61.0
Charleston.....	4.41	78.2	55.3
Atlanta.....	2.04	76.2	56.1
Wilmington.....	3.08	75.2	55.5
Memphis.....	2.02	78.3	54.6
Galveston.....	5.73	82.6	60.4
Vicksburg.....	4.21	79.8	56.8
Montgomery.....	2.28	79.8	58.0
Augusta.....	2.64	77.5	67.4
Little Rock.....	4.34	78.3	54.5
Mobile.....	2.34	81.7	58.3

## WINDS.

The prevailing direction of the winds during the month of October, 1882, at Signal Service stations, are shown on chart ii., by arrows flying with the wind. Along the Atlantic coast, the prevailing winds are from the northeast. Throughout the remainder of the country, east of the Rocky mountains, they are, with but few exceptions, southerly. In the north Pacific coast region, they are from the south and southwest, and in the Middle and South Pacific coast regions from the south, west, and southwest.

## TOTAL MOVEMENTS OF THE AIR.

[In miles.]

The following are the largest total movements at the Signal Service stations: On the summit of Mount Washington, New Hampshire, 23,954; on the summit of Pike's Peak, Colorado, 20,813; Portsmouth, North Carolina, 13,477; Hatteras, North Carolina, 12,895; Kittyhawk, North Carolina, 12,632; Delaware Breakwater, 11,711; Block Island, Rhode Island, 11,353; Cape Henry, Virginia, 10,684; Barnegat, New Jersey, 10,518; Sandy Hook, New Jersey, 10,279; Fort Macon, North Carolina, 9,849; Eagle Rock, Idaho, 9,864; Cape May, New Jersey, 9,475; Fort Shaw, Montana, 9,452; Dodge City, Kansas, 9,407; Port Eads, Louisiana, 9,382; Galveston, Texas, 8,934; Fort Assinniboine, Montana, 8,617; Indianola, Texas, 8,530; Sandusky, Ohio, 8,470; Duluth, Minnesota, 8,320; Mackinac City, Michigan, 8,002. The smallest total movements are: Lynchburg, Virginia, 1,546; Morgantown, West Virginia, 1,708; Silver City, New Mexico, 1,775; Lewiston, Idaho, 1,997; Williamsport, Pennsylvania, 2,035; Visalia, California, 2,218; Washington, District of Columbia, 2,494; Uvalde, Texas, 2,597; Fort Missoula, Montana, 2,655; Dubuque, Iowa, 2,676; Tucson, Arizona, 2,761; Augusta, Georgia, 2,832; Cincinnati, Ohio, 2,969; San Antonio, Texas, 2,978.

## HIGH WINDS.

Maximum velocities of fifty miles per hour or more have been reported, as follows:

On the summit of Mount Washington, New Hampshire, 56, nw., 1st; 80, nw., 2d; 60, nw., 3d; 80, nw., 4th; 65, nw., 7th; 60, nw., 8th; 73, w., 9th; 90, w., 10th; 62, nw., 11th; 60, nw., 14th; 64, s., 16th; 62, sw., 17th; 53, s., 22d; 78, nw., 25th; 86, nw., 26th; 66, nw., 27th; 100, s., 29th (maximum for month); 66, nw., 30th; 84, w., 31st.

On the summit of Pike's Peak, Colorado, 56, w., 2d; 54, sw., 3d; 52, sw., 5th; 72, w., 10th; 84, w., 11th; 64, sw., 14th; 56, w., 15th; 52, w., 16th; 54, sw., 21st; 54, n., 22d; 62, w., 24th; 64, sw., 25th; 68, w., 26th; 53, nw., 27th; 56, w., 28th; 96, sw., 29th (maximum for month); 60, sw., 30th.

Portsmouth, North Carolina, 56, ne., 12th.

Cedar Keys, Florida, 56, s., 10th.

Cape Henry, Virginia, 56, n., 24th.

Eagle Rock, Idaho, 54, w., 12th.

Kittyhawk, North Carolina, 52, ne., 12th.

Galveston, Texas, 52, n., 19th.

Milwaukee, Wisconsin, 52, s., 30th.

Fort Keogh, Montana, 52, w., 27th.

Umatilla, Oregon, 51, w., 11th.

Fort Maginnis, Montana, 50, w., 27th.

## LOCAL STORMS.

**California:** A destructive wind and rain storm occurred in the state, on the 2d. The following notes are given in connection with it: Marysville: The wind caused much damage to trees; large quantities of fruit were blown from the trees. Chico: Trees and shrubbery were blown down. The wind attained a hurricane-like force. North San Juan: The storm was very fierce in this vicinity, but there was no serious damage to property. Stockton: The storm continued with extreme violence for fifteen hours; several buildings were damaged, and many trees were blown down. San Francisco: The storm did some damage to vessels in the bay; one barge was capsized. The sea was very rough. Sacramento: This was the heaviest October storm ever recorded here. It approached very suddenly, and the barometer did not fall until the storm had reached this locality. The damage to the wheat, hay, and grape crops is estimated at \$400,000. The greatest damage was done in the Sacramento, San Joaquin, and Napa valleys, and was caused by the heavy rains. Some bulkheads and many shade trees were blown down.

**Iowa:** A tornado occurred about five miles east of Davenport, on the afternoon of the 30th. At 3.30 p. m., two funnel-shaped clouds were observed to unite at a point about five miles northeast of Davenport; the tornado-cloud then moved by a zig-zag course through Scott county in a northeasterly direction toward Princeton, where it appears to have expended its energy. The path of the tornado was about one quarter of a mile wide and about eighteen miles long; the cloud appeared to rise and fall, striking the earth at intervals, when it caused much damage. Three houses were totally demolished, and thirty dwellings and barns were unroofed or seriously damaged; hay-stacks were carried away and farming implements were much damaged. The total loss is estimated at \$60,000. Two persons were fatally injured by falling ruins, and six others sustained more or less serious injury. At Davenport, the storm was unattended by wind, but hailstones of unusual size fell (see hail storms), and the atmosphere was warm and sultry. Persons in East Davenport stated that a sullen, roaring noise was heard at that place, immediately before the formation of the tornado-cloud.

**Kansas:** A storm, accompanied by high wind, occurred at Fort Scott, on the 30th. Many signs were blown down, and other slight damage was done.

**Minnesota:** On the 12th, the wind reached a velocity of forty-eight miles an hour, at Saint Paul. The State Armory building was blown down, and much damage was done to trees and fences.

**Missouri:** A heavy wind storm occurred at Boonville, on the afternoon of the 12th. The damage to property was slight.

**New York:** During a heavy gale that occurred over Lake Erie, on the 29th, several schooners sustained more or less damage. Much damage was done on the Canadian shore by this storm.

**Texas:** A heavy wind storm, accompanied by thunder and lightning and torrents of rain, occurred at Dallas, on the night of the 15th. The wind caused much damage to trees, fences, and houses, and especially to the cotton crop.

## VERIFICATIONS.

## INDICATIONS.

The detailed comparison of the tri-daily indications for October, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 86.03 per cent. The percentages for the four elements are: Weather, 87.28; direction of the wind, 83.06; temperature, 89.35; barometer, 84.39 per cent. By geographical districts, they are: For New England, 83.4; middle Atlantic states, 81.8; south Atlantic states, 87.3; east Gulf states, 86.5; west Gulf states, 88.0; lower lake region, 86.3; upper lake region, 91.2; Tennessee and the Ohio valley,

85.1; upper Mississippi valley, 87.9; lower Missouri valley, 81.0; north Pacific coast region, 91.7; middle Pacific coast region, 91.1; south Pacific coast region, 100.0.

There were one hundred and forty-four omissions to predict out of 3,813, or 3.79 per cent. Of the 3,669 predictions that have been made, one hundred and fifteen, or 3.11 per cent., are considered to have entirely failed; one hundred and eleven, or 3.03 per cent., were one-fourth verified; four hundred and forty-four, or 12.11 per cent., were one-half verified; three hundred and sixty-nine, or 10.06 per cent., were three-fourths verified; 2,630, or 71.69 per cent., were fully verified, so far as can be ascertained from the tri daily reports.

#### CAUTIONARY SIGNALS.

One hundred and forty-four cautionary signals were displayed during the month of October, 1882, of which one hundred and sixteen, or 80.56 per cent., were justified by winds of twenty-five miles per hour, at or within one hundred miles of the station. Four cautionary off-shore signals were displayed, of which three, or 75.0 per cent., were fully justified; four, or 100 per cent., were justified as to direction, and three or 75.0 per cent., were justified as to velocity. One hundred and forty-eight signals of all kinds were displayed, of which one hundred and nineteen or 80.41 per cent., were justified. The above does not include signals ordered at sixty-nine display stations, where the velocity is estimated only. Nine signals were ordered late.

One hundred and twenty-one winds of twenty-five miles or more per hour were reported, for which no signals were ordered; many of these were high local winds, or strong sea-breezes.

#### NAVIGATION.

##### STAGE OF WATER IN RIVERS.

In the table on the right-hand of chart iii., are given, the highest and lowest stages of water observed at the Signal Service stations, during the month of October, 1882. In the first column of this table, are given, the heights of water on the gauge, which have been found dangerous to property at the stations.

The rivers have remained low during the month. In the Mississippi, from Cairo to Vicksburg, the highest stages occurred on the 1st; at New Orleans, from the 2d to the 5th; and at Port Eads on the 9th. In the upper Mississippi, the highest stages occurred during the latter part of the month. In the Ohio river, the highest water occurred from the 1st to 5th; and in the Missouri, from the 7th to 15th.

The observer at Chattanooga, Tennessee, reports that, during the whole of the past summer, the Tennessee river has remained navigable from that city to Decatur, Alabama. In former years, navigation has usually been suspended from July to November, but during those months of the present year, the river has remained at a good boating stage, and navigation has, at no time, been interrupted.

On the 19th, the Red river, at Shreveport, Louisiana, rose rapidly, and caused a suspension of work on the railroad bridge in course of construction at this place.

#### HIGH TIDES.

Ocean City, Maryland, 24th. Very high tide, washing over the narrow peninsula in several places.

Hatteras, North Carolina, 13th. Very high tide, overflowing the lower part of the island.

Easport, Maine, 1st, 2d, 3d.

Portsmouth, North Carolina, 1st, 2d, 12th, 24th.

Cape Lookout, North Carolina, 1st to 4th, 13th, 14th.

Fort Macon, North Carolina, 24th, 25th.

Cedar Keys, Florida, 11th.

Punta Rassa, Florida, 9th.

Port Eads, Louisiana, 8th, 9th, 10th.

#### FLOODS.

But few floods have occurred during the month, and these were of local character.

Dallas, Texas. During a heavy rain storm which occurred on the 15th, all streams were swollen, and Trinity river rose at

the rate of four feet per hour. Several bridges were swept away, and serious washouts occurred on the various railways.

Mobile, Alabama, 31st. Very heavy rain fell from 6.30 to 9.00 p. m.; streets were flooded and business was entirely suspended in the lower part of the town.

Palestine, Texas, 6th. A very heavy rain storm occurred, on this date, at Riverside, a station on the International and Great Northern railroad. Culverts and embankments were washed away, and other damage was done.

Saint Joseph, Missouri, 12th. During a heavy rain storm, the streets were flooded. Many bridges were washed away, and other damage was done.

Joplin, Missouri, 12th. The mines in the vicinity of this place were flooded by the heavy rain, causing delay of work for several days.

Georgetown, South Carolina, 20th and 21st. The heavy rains of these dates caused destructive floods in this vicinity, and much damage to the rice crop.

#### TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors, at the Signal Service stations, and the average depth at which the observations were taken, are given in the table on the right-hand of chart ii. In the first column of the table, is given, the maximum temperature observed during the month; and in the second column, the minimum temperature observed during the same period.

The following are the greatest monthly ranges: 18° at Grand Haven, Michigan; 17° at Milwaukee, Wisconsin; 17° at Galveston, Texas; 15° at Indianola, Texas; and 15° at Chincoteague, Virginia. The smallest are: 1° at Eastport, Maine; 2° at San Francisco, California; 3° at Toledo, Ohio; 4° at Smithville, North Carolina; 4° at Port Eads, Louisiana, and 5° at New London, Connecticut.

The following table gives the highest and lowest temperatures of water at the several stations; the range of water temperature; the mean temperature of the air at the station; and the depth of water at which the observations were taken:

Temperature of Water for October, 1882.

STATION.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
	°	°	°	ft. in.	°
Atlantic City, New Jersey .....	67.3	60.0	7.3	7 5	60.8
Alpena, Michigan .....	59.5	43.7	5.8	11 5	50.2
Augusta, Georgia .....	75.0	63.5	12.5	6 0	67.8
Baltimore, Maryland .....	69.0	60.5	8.5	10 0	61.5
Block Island, Rhode Island .....	61.0	55.0	6.0	8 7	57.4
Boston, Massachusetts .....	59.4	53.0	6.4	25 0	54.6
Buffalo, New York .....	66.0	55.0	11.0	8 5	55.1
Burlington, Vermont .....	62.0	52.0	10.0	17 6	51.9
Cedar Keys, Florida .....	82.0	70.0	12.0	10 6	73.7
Charleston, South Carolina .....	74.7	67.4	7.3	41 3	69.5
Chicago, Illinois .....	66.7	52.1	14.6	8 0	56.5
Chincoteague, Virginia .....	73.5	58.0	15.5	6 3	62.7
Cleveland, Ohio .....	64.7	55.6	9.1	14 0	56.3
Detroit, Michigan .....	65.0	52.0	13.0	24 2	57.8
Delaware Breakwater, Maryland .....	73.1	59.3	13.8	6 4	62.4
Duluth, Minnesota .....	60.0	51.0	9.0	15 7	49.1
Eastport, Maine .....	49.7	48.7	1.0	49 4	49.6
Escanaba, Michigan .....	66.0	51.0	15.0	15 0	56.9
Galveston, Texas .....	80.0	63.0	17.0	14 11	76.2
Grand Haven, Michigan .....	65.0	45.0	18.0	18 0	54.8
Indianola, Texas .....	83.4	67.6	15.8	9 7	75.9
Jacksonville, Florida .....	75.0	70.0	5.0	18 0	72.6
Key West, Florida .....	86.0	74.8	11.2	15 3	79.6
Mackinac City, Michigan .....	60.0	48.4	11.6	13 0	52.1
Marquette, Michigan .....	55.8	45.9	9.9	10 6	50.1
Milwaukee, Wisconsin .....	65.5	48.1	17.4	8 0	55.8
Mobile, Alabama .....	75.5	73.0	2.5	14 7	71.4
New Haven, Connecticut .....	65.5	55.2	10.3	15 6	55.3
New London, Connecticut .....	63.0	55.0	8.0	12 6	56.7
Newport, Rhode Island .....	63.1	56.5	6.6	11 2	56.4
New York City .....	64.5	57.5	7.0	21 8	58.5
Norfolk, Virginia .....	73.0	60.0	13.0	18 0	64.1
Pensacola, Florida .....	77.7	71.1	6.6	18 0	71.2
Portland, Maine .....	56.0	50.0	6.0	21 0	54.3
Portland, Oregon .....	59.8	47.3	12.5	58 2	50.6
Port Eads, Louisiana .....	77.7	73.5	4.2	9 4	74.5
Provincetown, Massachusetts .....	59.5	53.0	6.5	14 0	55.8
Punta Rassa, Florida .....	85.0	75.6	9.4	11 7	76.3
Sandusky, Ohio .....	66.1	51.6	14.5	10 0	57.3
Sandy Hook, New Jersey .....	66.3	58.8	7.5	1 6	59.9
San Francisco, California .....	58.1	56.0	2.1	32 4	58.1
Savannah, Georgia .....	74.9	65.9	9.0	13 1	69.3
Smithville, North Carolina .....	72.0	68.0	4.0	10 0	66.6
Toledo, Ohio .....	67.0	53.7	13.3	11 0	57.8
Wilmington, North Carolina .....	74.5	62.0	12.5	13 0	67.5

\* Observation not taken on 9th.



## ATMOSPHERIC ELECTRICITY.

## AURORAS.

The auroral display of the 2d, although not observed extensively in the United States, was probably the most important of the month. It was observed at numerous stations in the British Isles; by vessels on the Atlantic ocean; generally at stations in Canada and New England, and at a few stations in the lake region.

The following communication by Mr. W. H. M. Christie, of the Royal Observatory, Greenwich, relating to this display is taken from "Nature," of October 12, 1882:

"At 21 h. 40 m. (Greenwich mean time) on October 1st, a sudden disturbance of the magnetic declination and horizontal force commenced, and the motions were rapid, though not exceptionally large, until about 6 h. 50 m. on October 2d, when a large decrease of declination and horizontal force took place. From about 6 h. 50 m. to 7 h. 20 m., the declination diminished  $1^{\circ}$ , and the horizontal force about 1-70th part. The motions were active till 11 h., less so till 14 h. or 15 h., when the disturbance ended. There was much activity between 9 h. and 10 h.

Both earth-current traces showed a sudden commencement of disturbance at 21 h. 40 m., just as in the case of the magnetic registers, the times of greatest activity, and the time of cessation of disturbance being also coincident. As is usually the case, earth-currents were more active along the north and south line than along the east and west.

As regards the aurora, a bright arch extended along the north horizon to an altitude of  $20^{\circ}$ , from 6 h. 48 m. to 7 h. 30 m., and remarkable outbursts of streamers were noted, from 6 h. 45 m. to 7 h. 30 m., and from 9 h. 8 m. to 9 h. 25 m., corresponding closely, in point of time, with the more active parts of the magnetic disturbance. Patches of phosphorescent light were seen in various parts of the southern sky, between 7 h. and 7 h. 36 m., and ruddy light (principally near Arcturus) was observed between 6 h. 45 m. and 7 h. 30 m.

In connection with this magnetic disturbance, it is to be remarked that a large spot was on the central meridian of the sun, on September 30th, having been first seen near the east limb, on September 25th. It increased considerably in size as it passed across the disc, and its dimensions on September 30 were:—length 108''; breadth 65''; area of whole spot (in millionths of the sun's visible hemisphere,) 990; of umbra, 215. There was a line of smaller spots following it 128'' in length, with an area of 520, and a spot of considerable size near the equator, forming, on October 1st, with the large spot, three spots visible to the naked eye. The large spot was nearly in the same position on the sun's surface as the great spot of last April, its heliographic longitude being  $51^{\circ}$ , and latitude  $22^{\circ}$  S., whilst the position of the great spot on April 10th, was longitude  $65^{\circ}$ , latitude  $29^{\circ}$  S.; and at its next return, longitude  $52^{\circ}$ , latitude  $29^{\circ}$  S."

The aurora was witnessed on board the s. s. "Arizona," in N.  $51^{\circ}$ , W.  $28^{\circ}$ . It was first observed at 7 p. m. (ship's time), but was most brilliant between 12.00 and 12.15 p. m. (Greenwich mean time); sheets of light resembling the folds of a curtain, passed rapidly across the northern sky. The light was colorless, with occasional flashes of crimson.

In Canada, the following stations reported the display: Fredericton and Saint John, New Brunswick; Halifax and Sydney, Nova Scotia.

The following descriptions of the display, as observed at stations in the United States have been received:

Eastport, Maine, 2d: A brilliant auroral arch of about  $25^{\circ}$  altitude, was visible from 6.55 p. m., until early morning of the 3d.

Gardiner, Maine, 2d: At 7.30 p. m. there appeared a bright auroral arch of about  $10^{\circ}$  in height, with beams below and above the arch. At 9.00 p. m. it had almost disappeared; at 11.00 p. m., although the moon shone brightly, the aurora was still visible, but the arch had disappeared, leaving only a light

which extended to an altitude of  $25^{\circ}$ . The display continued until morning of the 3d.

Burlington, Vermont, 2d: An aurora, consisting of a pale yellow light, was visible from 10.00 p. m. to midnight.

Mount Washington, New Hampshire, 2d: An auroral display, extending from northwest to northeast, was observed from 10.00 to 10.40 p. m.; it consisted of waves of a whitish color which flashed from the horizon to the zenith.

New Haven, Connecticut, 2d: A dim auroral light of brief duration was first observed at 7.20 p. m.

Block Island, Rhode Island, 2d: A faint aurora was observed from 8.40 to 10.45 p. m.

Cambridge, Massachusetts, 2d: An extensive auroral light was observed during the evening, among the clouds. At 7.45 p. m., a few faint streamers were observed. The following New England stations also report its appearance: Fall River, Rowe, and Somerset, Massachusetts; Bangor, Cornish and Orono, Maine; Auburn, and Grafton, New Hampshire and Woodstock, Vermont.

North Volney, New York, 2d: A diffuse auroral light in the north; partly obscured by clouds.

Alpena, Michigan, 2d: At 9.30 p. m. a diffuse auroral light, with a few small streamers, was observed in the northern sky. The display ended at 10.25 p. m.

Mackinac City, Michigan, 2d: Auroral light from 10.00 p. m. to 12.30 a. m. of the 3d, consisting of a few streamers, reaching an altitude of  $25^{\circ}$ .

Grand Haven, Michigan, 2d: At 8.30 p. m., an aurora, resembling the morning dawn, extended from  $10^{\circ}$  east of north to  $10^{\circ}$  west, and to an altitude of  $25^{\circ}$ .

The most widely observed display in the United States was that of the 5th. It was observed from New England westward to Wyoming and Montana, and southward to stations in northern Virginia, central Illinois, and northern Kansas.

The following are some of the most noteworthy descriptions:

Eastport, Maine, 5th: At 7.00 p. m., a brilliant auroral arch of  $25^{\circ}$  altitude was observed. It was of whitish color and remained visible until the early morning of the 6th.

Bangor, Maine, 5th: Very brilliant aurora visible throughout the entire night.

Mount Washington, New Hampshire, 5th: At 10.50 p. m., an aurora was observed extending from west to east, and consisting of waves of white light which flashed rapidly from the horizon. The display ended during the early morning of the 6th.

Burlington, Vermont, 5th: From 9.00 p. m. to midnight, the display was very brilliant. It consisted of a bright well-defined arch of light; streamers shot upward to the zenith. The light extended from northwest to northeast.

Boston, Massachusetts, 5th: From 10.20 p. m. to midnight, an auroral light, reaching an altitude of  $90^{\circ}$  and covering  $90^{\circ}$  of the horizon, was visible. It was of a pale blue color with waves and streamers.

Springfield, Massachusetts, 5th: At 11.00 p. m., a pale auroral light was visible through the openings in the clouds. After midnight the color changed to crimson and became very brilliant.

Thatcher's Island, Massachusetts, 5th: The auroral display was observed from 8.45 p. m. to 1.30 a. m. of the 6th. It consisted of an arch of deep yellow color resting upon a dark base. Beams of yellowish light shot upward toward the zenith. The aurora extended from an altitude of from  $25^{\circ}$  to  $60^{\circ}$  and covered  $40^{\circ}$  of the horizon.

Atlantic City, New Jersey, 5th: From 8.45 to 11.40 p. m. an auroral light of yellowish color extended upward to an altitude of  $30^{\circ}$ , and from  $30^{\circ}$  east of north to  $30^{\circ}$  west; a few streamers, extending to an altitude of  $45^{\circ}$ , were observed.

Woodstock, Maryland, 5th: A faint aurora, consisting of an arch with a dark cloud beneath, was observed at 10.00 p. m.

Washington, District of Columbia: The aurora was first observed at 2.20 a. m. of the 6th, as an irregular arch of light extending  $20^{\circ}$  on either side of the north point of the horizon,

and having extreme height of  $15^{\circ}$  above the horizon at the centre, and from  $8^{\circ}$  to  $10^{\circ}$  broad. Beneath this was the dark segment, which, in this case, may have been stratus cloud. When noticed, at 2.20 a. m., there was a single bright streamer  $20^{\circ}$  west of north and extending  $30^{\circ}$  toward the zenith. At frequent intervals there were seen flashes of lightning at the upper edge of the dark segment, betokening possibly a storm to the northward. At 3.17 a. m., the arch brightened up and a few faint streamers were seen, having a lateral motion from east to west. The light of the waning moon undoubtedly interfered in part with the display.

Fort Myer, Virginia, 5th: From 8.30 to 11.15 p. m., bright auroral beams, reaching an altitude of  $30^{\circ}$ , were observed in the northern sky.

Rochester, New York, 5th: At 9.30 p. m., a brilliant aurora, of pale yellow color changing to bright red, was observed in the northeastern sky. It consisted of numerous slender beams, which occasionally shot upward to within a few degrees of the zenith. The display ended at 2.30 a. m., of the 6th.

Erie, Pennsylvania, 5th: At 8.40 p. m., an aurora was observed, consisting of waves of bright light flashing to the zenith. The display ended at 1.15 a. m., of the 6th.

Chicago, Illinois, 5th: At 9.15 p. m., a faint auroral glow, extending from  $15^{\circ}$  west of north to  $25^{\circ}$  east, and to an altitude of  $25^{\circ}$ , was observed in the northern horizon. At 10.30 p. m., faintly-defined streamers shot upward in the north to a height of  $35^{\circ}$  and slowly faded away. Later, an arch was formed which extended from northwest to southeast. It was apparently about the width of an ordinary rainbow but was wider at the extremities. The display ended at 11 p. m.

Dubuque, Iowa, 5th: At 8.55 p. m., an aurora was visible in the north; at 10.18 p. m., a bright band shot upward from the west with no visible connection with the light in the north. This band appeared instantaneously, passing about  $10^{\circ}$  south of the zenith and reached the horizon. It remained intact for thirty minutes, when it moved slowly southward and gradually broke up about  $15^{\circ}$  south of the zenith. The eastern part disappeared first, leaving the western end visible, which resembled an immense feathery plume. During the presence of this band, the light remained in the north, and after its disappearance, a few streamers were observed.

Northfield, Minnesota, 5th: Bright auroral arch at 11.00 p. m.

Tobacco Garden, Dakota, 5th: Aurora visible at 7.30 p. m. At 9.00 p. m., streamers and curtains of light were very brilliant. At that hour, the aurora extended over about  $105^{\circ}$  of the horizon and to an altitude of  $45^{\circ}$ ; at 9.15 p. m., it covered over  $180^{\circ}$  of the horizon and extended to the zenith.

Fort Keogh, Montana, 5th: At 8.10 p. m., an aurora of pale yellow color, was observed, extending from northwest to northeast and to an altitude of  $40^{\circ}$ . A few streamers appeared between 10.20 and 10.30 p. m., having a motion from northwest to northeast. Soon after this time, the display faded away.

Fort Benton, Montana, 5th: From 8 to 10 p. m., an aurora was observed, extending from northwest to northeast. It consisted of streamers and tremulous waves of straw-colored light.

Fort Washakie, Wyoming, 5th: At 7 p. m., a pale circular light was observed. At 8.10 p. m., a well-defined aurora was visible, which increased in brilliancy until 9.00, when beams appeared, shooting upward with a quick longitudinal movement. The display ended at 10.00 p. m.

Umatilla, Oregon, 5th: At 7.30 p. m., an aurora was observed, consisting of slender luminous beams, reaching an altitude of  $15^{\circ}$ . It was most brilliant from 7.50 to 8.50 p. m., after which time it faded away somewhat, but it was reported to be very brilliant between 1.00 and 2.00 a. m., of the 6th. The display continued until 5 a. m.

There were other displays, of less extent and brilliancy, during the month. They occurred on the following dates: 3d, 4th, 6th, 8th, 10th, 11th, 12th, 14th, 15th, 16th, 22d, 23d. The most noteworthy of these was the display of the 4th, which was observed at stations east of the eighty-second meridian to the Atlantic, and as far south as Kittyhawk, North Carolina.

Professor C. Carpmal, superintendent of the meteorological service of the Dominion of Canada, reports auroral displays, which were not observed in the United States, on the following dates: 9th, 21st, 27th, 28th.

#### THUNDER-STORMS.

Thunder-storms were reported in the various districts on the following dates:

*Middle Atlantic states:* 23d, 24th, 27th, 28th.

*South Atlantic states:* 10th, 11th, 20th, 23d, 28th to 31st.

*Florida peninsula:* 1st, 3d, 7th, 8th, 9th, 13th, 31st.

*East Gulf states:* 1st, 7th, 8th, 12th, 13th, 18th, 29th, 30th, 31st.

*West Gulf states:* 1st, 5th to 9th, 12th to 16th, 18th, 28th, 29th.

*Rio Grande valley:* 3d, 5th, 8th, 15th.

*Ohio valley and Tennessee:* 1st, 2d, 3d, 7th, 8th, 12th, 13th, 27th to 31st.

*Lower lake region:* 5th, 9th, 13th, 27th to 31st.

*Upper lake region:* 3d to 7th, 9th, 12th, 13th, 20th, 28th, 30th.

*Extreme northwest:* 1st, 3d to 6th.

*Upper Mississippi valley:* 1st to 8th, 11th, 12th, 13th, 15th, 26th, 27th, 28th, 30th, 31st.

*Missouri valley:* 1st to 12th, 14th, 15th, 16th, 27th, 28th, 30th, 31st.

*Northern slope:* 1st to 5th, 9th, 11th.

*Middle slope:* 2d to 7th, 9th, 11th, 12th, 15th, 16th, 27th, 28th, 30th, 31st.

*Southern slope:* 2d to 7th, 10th, 15th, 16th.

Thunder-storms were also reported from the following stations not included in the districts named above: Coalville, Utah, 2d; Tucson, Arizona, 3d; Santa Fé, New Mexico, 1st; Colfax, Washington Territory, 15th; Red Bluff, California, 1st; Portland, Oregon, 10th.

The following instances of damage by lightning during thunder-storms have been reported:

Mobile, Alabama, 31st: A flag staff, used for the display of storm signals, was struck by lightning and demolished.

Port Eads, Louisiana, 1st: At a 2.00 a. m., during a heavy rain and thunder storm, the carpenter shop of the Jetty company was struck by lightning and burned, entailing a loss of from \$6,000 to \$7,000.

Logansport, Indiana, 28th: A building near the Signal office, was struck and damaged by lightning.

Springfield, Illinois, 28th: Building struck and damaged by lightning.

Wicklow, Dakota, 11th: A house was struck and injured by lightning.

Fallsington, Pennsylvania, 27th: During a thunder-storm at Yardleyville, near this place, a barn was struck by lightning and burned, in which were eight cows, four horses, crops and farming implements, all of which were destroyed.

Pierce City, Missouri, 29th: During the storm last night, the lightning struck a barn, four miles from here, killing one man and four horses.

Hagerstown, Ohio, 31st: A barn near here was struck by lightning during a thunder storm and totally destroyed. Loss about \$2,000.

#### OPTICAL PHENOMENA.

##### SOLAR HALOS.

Solar halos have been observed in the various districts, on the following dates:

*New England:* 2d, 9th, 15th, 20th, 21st, 27th, 30th.

*South Atlantic states:* 1st, 3d, 8th, 10th.

*Ohio valley and Tennessee:* 1st, 2d, 3d, 5th, 7th, 13th, 18th, 25th, 26th, 28th.

*Lower lake region:* 13th, 22d, 25th, 26th.

*Upper lake region:* 2d, 18th, 20th, 21st, 23d, 25th, 26th.

*Upper Mississippi valley:* 1st, 4th to 7th, 14th, 18th, 21st, 24th to 27th.

*Missouri valley:* 4th, 5th, 18th to 22d, 25th, 26th.



Solar halos were also reported from the following stations, not included in the districts named above:

Albany, New York, 8th, 20th.  
Key West, Florida, 4th, 24th.  
Punta Rassa, Florida, 10th.  
Fayette, Mississippi, 5th.  
Palestine, Texas, 2d, 21st, 27th.  
Tobacco Garden, Dakota, 6th, 25th.  
Fort Keogh, Montana, 11th, 21st.  
Fort Lyon, Colorado, 17th.  
Santa Fé, New Mexico, 6th.  
Yuma, Arizona, 23d.  
Salt Lake City, Utah, 6th, 24th.  
Coalville, Utah, 23d.  
Carson City, Nevada, 4th, 9th.  
Colfax, Washington Territory, 2d, 3d, 9th, 21st, 27th.  
Lewiston, Idaho, 2d, 9th, 23d.  
San Francisco, California, 5th, 9th, 10th, 13th, 20th, 22d, 23d, 26th.  
San Diego, California, 20th, 22d, 23d.  
Poway, California, 23d.  
Princeton, California, 9th.

#### LUNAR HALOS.

Lunar halos have been observed in the various districts, on the following dates:

*New England:* 1st, 20th, 24th, 25th, 27th, 28th, 30th.  
*Middle Atlantic states:* 3d, 18th, 21st, 22d, 25th, 26th, 27th.  
*South Atlantic states:* 2d, 25th, 26th, 29th, 30th.  
*East Gulf states:* 5th, 6th, 26th.  
*West Gulf states:* 23d to 26th, 30th.  
*Ohio valley and Tennessee:* 2d, 14th, 19th, 21st, 23d to 26th, 29th, 30th.  
*Lower lake region:* 1st, 18th, 22d, 23d, 26th, 27th, 29th, 30th, 31st.  
*Upper lake region:* 2d, 18th to 26th, 28th, 30th.  
*Extreme northwest:* 20th, 21st, 25th.  
*Upper Mississippi valley:* 1st, 18th to 22d, 24th to 28th.  
*Missouri valley:* 1st, 2d, 3d, 20th, 21st, 24th to 27th, 29th.  
*Northern slope:* 19th, 21st, 23d to 27th, 31st.  
*Middle slope:* 2d, 21st, 24th, 25th.  
*Southern slope:* 23d to 26th.  
*Southern plateau:* 1st, 23d, 24th, 26th.  
*Middle plateau:* 20th, 23d, 24th, 25th, 27th.  
*Northern plateau:* 21st to 26th, 29th.  
*California:* 3d, 22d, 23d, 25th, 31st.

Lunar halos were also reported from the following stations, not included in the districts named above:

Key West, Florida, 24th, 26th.  
Eagle Pass, Texas, 18th.  
Albany, Oregon, 19th, 20th, 23d.

#### MIRAGE.

Indianola, Texas, 8th, 10th, 11th.  
Pretty Prairie, Kansas, 19th.  
Genoa, Nebraska, 22d, 23d.

#### MISCELLANEOUS PHENOMENA.

##### SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and eighty-two stations show 5,596 observations to have been made, of which twenty-two were reported doubtful; of the remainder, 5,574, or 85.6 per cent., were followed by the expected weather.

##### SUN SPOTS.

The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Massachusetts:

DATE— Oct., 1882.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		REMARKS.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 12 m...	1	15	0	0	0	0	6	45†	One spot very large.
2, 8 a. m...	0	0	0	0	0	0	6	45†	Do.
3, 8 a. m...	1	5	1	2	0	0	6	50†	Do.
4, 5 p. m...	0	0	0	10	0	0	6	40†	Do.
5, 8 a. m...	1	1	0	0	1	1	7	40†	Do.
6, 9 a. m...	0	0	1	10†	0	0	6	30†	Do.
6, 5 p. m...	0	0	0	5†	0	0	6	25†	Do.
7, 5 p. m...	0	0	2	12†	0	0	3	5	Spots all small.
8, 1 p. m...	0	0	1	2	0	0	1	2	
9, 8 a. m...	0	0	0	0	0	0	0	0	No faculae.
10, 8 a. m...	1	2	0	0	1	2	1	2	Do.
14, 7 a. m...	1	10	0	0	1	10	2	12	
15, 9 a. m...	0	5	0	0	0	5	2	17	
17, 4 p. m...	0	10†	0	0	-----	-----	2	35†	
18, 8 a. m...	1	10†	0	0	0	0	3	45†	
20, 5 p. m...	0	5	0	0	0	0	3	50†	
21, 4 p. m...	1	1	0	0	0	0	4	50†	
25, 8 a. m...	1	10	-----	-----	1	10	4	35†	Spots probably reappeared by solar rotation.
26, 7 a. m...	0	0	1	10†	0	0	3	25†	One spot very large.
27, 8 a. m...	1	2	1	5	1	1	3	20†	Do.
30, 7 a. m...	2	15†	2	15†	2	15†	3	20†	Do.
31, 4 p. m...	2	5	0	0	0	0	5	25†	Do.

† Approximated. Faculae were seen at the time of every observation, except on the 9th and 10th.

The following record of observations has been forwarded by Mr. A. S. Bender, of Sacramento, California:

DATE— Oct., 1882.	No. of new		Disappeared by rotation		Reappeared by rotation.		Total No. of		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
2, 4 p. m...	1	1	-----	-----	-----	-----	5	25†	One group disappeared.
4, 4 p. m...	2	10	-----	-----	-----	-----	7	35†	
7, 3 p. m...	-----	-----	3	30	-----	-----	1	1	Three groups of one and two spots each, disappeared other than by rotation.
9, 4 p. m...	-----	-----	-----	-----	1	1	1	1	One group of one spot disappeared.
10, 4.45 p. m...	-----	-----	-----	-----	-----	1	1	2	New spot of same group.
12, 4 p. m...	1	2	-----	-----	-----	-----	2	4	
13, 4 p. m...	1	10†	-----	-----	-----	-----	3	20†	
14, 4 p. m...	-----	-----	-----	-----	-----	-----	2	20†	One group of two spots disappeared.
15, 4 p. m...	1	10†	-----	-----	-----	-----	3	30†	
16, 4 p. m...	-----	-----	-----	-----	-----	-----	3	40†	Number of spots increased, some being very small and dim.
19, 4 p. m...	-----	-----	-----	-----	-----	-----	3	50†	Several of these spots small and dim.
20, 4 p. m...	1	10†	-----	-----	-----	-----	4	60†	New spot very large; came in by rotation. (Is one of those which disappeared on 6th or 7th instant.)
22, 4 p. m...	-----	-----	1	10	1	1	4	50†	
23, 4 p. m...	1	4	-----	-----	-----	-----	5	45†	Some very faint spots seem to attend the large one.
24, 4 p. m...	-----	-----	2	20	-----	-----	3	30†	Do.
25, 4 p. m...	-----	-----	-----	-----	-----	-----	2	20†	Do.
27, 4 p. m...	2	3	-----	-----	-----	-----	4	25†	The above now appear about 10 in number, and are, for the first time, included in the total number.
28, 4 p. m...	1	10	2	20	-----	-----	3	20†	Spots increased in size and diminished in number, those attending the large spot have disappeared.
29, 4 p. m...	-----	-----	-----	-----	-----	-----	3	10†	
30, 4 p. m...	-----	-----	-----	-----	-----	-----	3	10†	
31, 5 p. m...	2	10†	-----	-----	-----	-----	5	20†	

† Estimated.

Mr. H. D. Glowey at North Lewisburg, Ohio, reports: Sun spots were observed on all clear days during the month. They were most numerous on the 1st, smallest and least numerous on the 9th, and largest on the 1st and 26th. Mr. I. R. Zimmermann, at Wicklow, Lake county, Dakota, reports that three large spots were observed with the unassisted eye on the sun's disk, on the 25th.

##### METEORS.

Augusta, Georgia, 27th: A brilliant meteor was observed at 8.10 p. m., which started from a point near the zenith, and exploded when about 10° above the northwestern horizon. No report was heard at its explosion and disappearance.

Moorhead, Minnesota, 4th: At 7.40 p. m., a very brilliant

meteor was observed in the northeastern sky, apparently about two feet in diameter. During its passage, it produced a bright red light, and when at a point northwest of this city it exploded, emitting an intense white light. A second explosion followed with a blue light, and then a dark mass was observed to shoot toward the earth. It left a path of dazzling light that remained visible for about one minute, floating from northeast to southwest.

The following reports serve to indicate that the above meteor was the same as that observed at Saint Vincent, Minnesota, and at Alexandria, Dakota, on the same date. At the former station, at about 8.00 p. m., a brilliant meteor passed across the sky from east to west. It appeared to be about the size of an orange, and was intensely brilliant, resembling a ball of fire. It was visible several seconds, and illuminated the whole sky. A bright cloud was left in its track, which remained stationary for about fifteen seconds, when it twisted and coiled into a serpentine shape, floated southward and soon faded away. Alexandria, Dakota, 4th: At 7.30 p. m., a large meteor, was observed, emitting a light strong enough to indicate its path behind clouds of considerable density. It was first seen at an altitude of 45° in the northern sky, and left a trail which remained distinctly visible for several seconds after its disappearance.

Meteors have also been reported as follows:

Springfield, Massachusetts, 9th.  
 Palestine, Texas, 11th, 13th.  
 Logansport, Indiana, 15th.  
 Fort Yates, Dakota, 4th.  
 Tobacco Garden, Dakota, 5th, 7th.  
 Davenport, Iowa, 5th, 12th.  
 Yuma, Arizona, 11th, 12th, 17th, 28th.  
 Visalia, California, 2d, 16th, 17th, 18th, 30th.  
 Red Bluff, California, 5th.  
 Alexandria, Dakota, 16th, 25th, 31st.  
 Anna, Illinois, 11th.  
 Morrison, Illinois, 10th, 14th.  
 Swanwick, Illinois, 5th, 11th.  
 Vevay, Indiana, 15th, 30th.  
 Monticello, Iowa, 20th, 21st.  
 Indianola, Iowa, 28th.  
 Creswell, Kansas, 10th.  
 Yates Centre, Kansas, 3d.  
 Salina, Kansas, 15th.  
 Dexter, Maine, 15th.  
 Woodstock, Maryland, 4th, 7th, 18th, 24th, 30th.  
 Westerville, Ohio, 5th, 6th.  
 Marion, Ohio, 2d.  
 New Riegel, Ohio, 15th, 16th.  
 Fall River, Massachusetts, 10th, 11th.  
 Rowe, Massachusetts, 8th, 10th, 15th, 20th, 30th.  
 Fayette, Mississippi, 10th, 12th.  
 Protem, Missouri, 4th, 6th, 8th, 22d.  
 Freehold, New Jersey, 15th, 30th.  
 Palermo, New York, 14th.  
 Murfreesboro, Tennessee, 15th, 16th, 21st.  
 Beloit, Wisconsin, 1st.

#### EARTHQUAKES.

The shocks on the night of the 14th—15th, and of the afternoon of the 22d, were the most extensive, and the severest experienced during the month. The first-mentioned shock was reported by stations in eastern Missouri; throughout central Illinois, and is reported to have been felt as far eastward as Indianapolis, Indiana. The shock of the 22d was felt at various points in the states of Arkansas, Kansas, Missouri and Texas. Concerning this shock, the following reports have been received:

Mount Ida, Arkansas, 22d: At 4.15 p. m., a distinct shock, accompanied by a rumbling sound, was felt at various places in this (Montgomery) county.

Fort Smith, Arkansas, 22d: At 4.15 p. m., three distinct

shocks, all occurring within about thirty seconds were felt at this place. The vibrations were east and west. Houses were shaken so that furniture and crockery rattled; bells were rung, and in a few instances bricks were shaken from chimneys.

Little Rock, Arkansas, 22d: Two light shocks of earthquake were felt between 4.00 and 5.00 p. m. The shocks were separated by an interval of ten seconds, and the vibration was from southeast to northwest.

Rogers, Arkansas, 22d: A slight earthquake shock, continuing about thirty seconds was felt here at 4:12 p. m. Reports from Seligman, Missouri, state that it was also plainly felt at that place.

Fayetteville, Arkansas, 22d. An earthquake shock was felt here at 4.15 p. m. The vibration was from north to south, and lasted eight seconds. It was sufficiently violent to throw bottles from shelves.

Wichita, Kansas, 22d: An earthquake shock occurred at this place at 4.19 p. m. (Jefferson City, Missouri, mean time.) Its duration was about five seconds. There were three pulsations, the first being the strongest. Windows were rattled, the walls of buildings swayed, and furniture moved in houses.

Wellington, Kansas, 22d: A shock of earthquake was distinctly felt here about 4.00 p. m. The pulsation seemed to be east and west, and continued for several seconds.

Leavenworth, Kansas, 22d: A slight earthquake shock was felt here at 3.54 p. m. A tremulous movement of the earth was first noticed, which continued with even intensity from twenty to forty seconds, when a heavier shock followed, lasting about fifteen seconds. The disturbance then became less perceptible for about a minute and thirty seconds, when the most distinct shock occurred, which was sufficient to rattle windows and shake chandeliers.

Warrenton, Missouri, 22d: About 4.25 p. m., an earthquake shock was felt at this place. The vibration was north and south. The shock was sufficient to cause windows, etc., to rattle.

Sherman, Texas, 22d: An earthquake shock was felt at this place about 4.00 p. m. At the Eagle mills, which were shut down at the time, the machinery was seen to vibrate, and the belts creaked as if the engine was being started. At Compress, the shock was so violent as to ring the call-bell on the engine, and cotton bales standing on end were seen to sway. McKenny, Greenville, Bonham, and Paris, all in northern Texas, report having experienced the shock. At Paris, a clock was thrown from the side of a wall, and at Bonham, loose bricks were shaken from the top of a wall.

The following are reports of the shock on the night of the 14th-15th:

Saint Louis, Missouri, 14th: An earthquake shock occurred at 11.48 p. m., and was also felt at Saint Charles, Missouri. The shock covered about the same region as the one of September 27, 1882, but it was in general feebler.

Vandalia, Illinois, 15th: A well-defined earthquake shock, similar to that felt in this locality on the morning of September 27th, occurred at about 12.15 a. m. The noise preceding the shock is described as being similar to that of an approaching storm, and was plainly heard fully three minutes before the shock was felt. Houses seemed to rock, doors and windows rattled, and people were awakened. About an hour later a second shock was felt, though not so severe as the first.

Decatur, Illinois, 15th: Two slight shocks of earthquake were felt in this city last night, the first at 11.30 p. m. (14th), and the second at 4.30 a. m. Lamps and windows were shaken, and considerable alarm was felt.

Centralia, Illinois, 15th: Three shocks of earthquake were felt at this place during last night. The first shock occurred a few minutes after midnight, the second about 1.00 a. m., and the third at 3.30 a. m., the last being the severest.

Salem, Illinois, 15th: Two distinct earthquake shocks were felt here last night.

Bunker Hill Illinois, 15th: A distinct shock of earthquake occurred here at 1.00 a. m.



Indianapolis, Indiana, 15th: Several farmers from neighboring localities report the occurrence of an earthquake shock at 12.15 a. m.; vibration from northwest to southeast.

Springfield, Illinois, 15th: Three shocks of earthquake, sufficient to rattle windows, overturn bottles, &c., were felt in this city at 12.15 a. m. These were followed by a succession of milder shocks lasting about two minutes, and then by gentle undulations which continued for about ten minutes.

Other shocks have occurred during the month as follows:

Poway, California, 8th: An earthquake shock, severer than is usually felt here, occurred at 2.50 a. m.

San Diego, California, 8th: A heavy earthquake shock, lasting several seconds, occurred at this place at 2.00 a. m. The shock was generally felt in the surrounding country, and was the severest that has been experienced for many years.

Montreal, Canada, 10th: An earthquake shock occurred at 4.15 a. m., of sufficient violence to startle residents. Buildings and furniture were shaken, but no damage was done. Reports from Lachine state that the shock was distinctly felt at that place; and as was the case at Montreal, it was accompanied by a rumbling sound. The wave appears to have passed from northeast to southwest. Similar reports have been received from Saint Hilaire and other points. The shock seems to have been confined to hilly regions.

Winnemucca, Nevada, 12th: An earthquake shock is reported to have been felt in the southern part of Humboldt country. The tremor was from south to west, and was accompanied by a rumbling sound.

Murphy, North Carolina, 15th: A slight shock of earthquake occurred at this place at 12.30 p. m. The vibration was from south or southwest to north or northeast.

Point San José, California, 20th: A light earthquake shock occurred at 2.15 a. m.

San Francisco, California, 20th: A severe shock of earthquake was felt in this city at 2.15 a. m. The vibration appeared to be from southwest to southeast, and was of about one second's duration. On the 31st, a sharp shock occurred at 6.45 p. m., and was also felt at Sonoma, Napa, Petaluma, and San Rafael, in this state. The vibration was from west to east.

New-Berne, North Carolina, 23d: At about 7.00 a. m., a distinct shock, supposed to be that of an earthquake, was felt in this city. The shock was sufficient to shake houses, and was accompanied by a rumbling noise.

Saint Louis, Missouri, 26th: At 4.15 p. m., a slight shock of earthquake was felt in this city. Only a few persons noticed the shock, but the noise accompanying it was more generally heard.

At Panama, Central America, a slight shock occurred at midnight of 11th-12th. No damage resulted.

#### WATER-SPOUTS.

Captain Dale, of the brig "Leader," reported having seen a water-spout on October 24th, when the vessel was about two hundred and fifty miles south of Cape Hatteras.

#### SAND-STORMS.

West Las Animas, Colorado, 10th, 11th.

Yuma, Arizona, 11th, 15th.

Fort Verde, Arizona, 25th.

Camp Thomas, Arizona, 2d, 5th, 6th, 11th, 12th, 14th, 15th, 19th, 26th.

Los Angeles, California, 14th.

Fort Garland, Colorado, 11th, 29th.

#### POLAR BANDS.

Fort Myer, Virginia, 20th, 25th.

Palestine, Texas, 26th.

Nashville, Tennessee, 1st.

Yates Centre, Kansas, 26th.

Gardiner, Maine, 2d, 3d, 27th.

Fayette, Mississippi, 12th.

Protom, Missouri, 19th, 22d, 29th.

Freehold, New Jersey, 25th.

Vineland, New Jersey, 2d.

New Riegel, Ohio, 16th, 22d, 26th.

Wytheville, Virginia, 17th, 26th, 28th.

#### ZODIACAL LIGHT.

Havana, Cuba, 2d, 3d, 4th, 11th, 12th, 13th, 15th to 19th.

Palestine, Texas, 8th to 11th.

Little Rock, Arkansas, 10th.

Nashville, Tennessee, 3d, 6th, 10th to 15th, 27th, 28th, 30th, 31st.

Monticello, Iowa, 12th.

Cambridge, Massachusetts. Suspected on 3d and 9th; visible on 10th, 15th, and 16th.

Northport, Michigan, 14th.

New Riegel, Ohio, 16th, 20th, 21st, 22d, 24th.

Stateburg, South Carolina, 19th.

Wytheville, Virginia, 15th.

Pensacola, Florida, 12th.

#### PRAIRIE FIRES.

Huron, Dakota, 28th: During the early morning, the wind changed to northwest, and reached a velocity of forty-one miles per hour, causing the prairie fires to jump the ordinary fire-brakes, which are from ten to fifteen feet in width. The citizens turned out at an early hour, and by 4.00 p. m., had succeeded in conquering the flames. The fires have done great damage in this vicinity. A number of unprotected hay- and grain-stacks, shanties, barns, etc., were destroyed. A man and team narrowly escaped perishing, and were seriously burned. In one instance, a horse was surrounded by the fires and, unable to escape, was burned to death.

Prairie fires have also been reported as follows:

Yankton, Dakota, 14th to 17th, 30th, 31st.

North Platte, Nebraska, 14th.

Fort Sill, Indian Territory, 28th, 29th.

Fort Bayard, New Mexico, 21st.

Fort Randall, Dakota, 25th.

Fort Meade, Dakota, 13th, 14th.

Poway, California, 19th.

Morrison, Dakota, 15th.

Wicklow, Dakota, 5th, 8th, 13th, 14th, 15th, 28th.

Humboldt, Iowa, 28th, 30th.

#### DROUGHT.

Johnstown, New York, 31st: The month has been dry and dusty throughout. The fields are too dry for ploughing.

Charlotte, Vermont, 31st: The springs and wells have not recovered from the effects of the drought experienced during the summer.

Woodstock, Vermont: Month dry, wells and streams becoming low at the close of the month.

#### MIGRATION OF BIRDS.

*Geese flying south:* Newport, Rhode Island, 12th; Bangor, Maine, 6th; Palestine, Texas, 18th, 26th; Indianola, Texas, 26th; Jacksboro, Texas, 10th, 12th, 14th, 17th, 19th, 22d; Fort Smith, Arkansas, 28th; Creswell, Kansas, 10th, 11th, 20th, 23d; Independence, Kansas, 30th; Yates Centre, Kansas, 20th; Fort Scott, Kansas, 23d; Pretty Prairie, Kansas, 7th; Protom, Missouri, 23d, 24th, 31st; Flushing, New York, 29th; North Volney, New York, 11th; Franklin, Pennsylvania, 10th; Wellsboro, Pennsylvania, 23d, 24th; Stateburg, South Carolina, 14th; Ashwood, Tennessee, 12th; Austin, Tennessee, 29th; Nashville, Tennessee, 19th; Memphis, Tennessee, 9th; Embarrass, Wisconsin, 11th, 23d; La Crosse, Wisconsin, 15th; Cleveland, Ohio, 18th; Saint Vincent, Minnesota, 1st; Morgantown, West Virginia, 13th, 17th; Tobacco Garden, Dakota, 10th, 17th; Huron, Dakota, 1st, 10th, 16th; Yankton, Dakota, 28th; Morrison, Dakota, 9th, 13th, 14th, 31st; Alexandria, Dakota, 9th; Dubuque, Iowa, 7th; Davenport, Iowa, 23d; Monticello, Iowa, 23d; Cairo, Illinois, 13th, 18th, 24th, 27th, 29th; Campaign, Illinois, 31st; Fort Wayne, Indiana, 19th; Fort Sill, Indian Territory, 28th, 29th, 30th; Red Bluff, California, 23d; Poway, Califor-

nia, 2d; Portland, Oregon, 13th, 15th, 25th, 26th; Roseburg, Oregon, 29th; Lewiston, Idaho, flying east, 29th; Yankton, Dakota, flying southeast, 25th.

*Ducks flying south:* Portsmouth, North Carolina, 17th; Shreveport, Louisiana, 17th; Indianola, Texas, 26th; Coleman City, Texas, 18th; Nashville, Tennessee, 19th; Memphis, Tennessee, 31st; Toledo, Ohio, 26th; Grand Haven, Michigan, 19th; Saint Louis, Missouri, 26th; Protem, Missouri, 18th, 27th; Creswell, Kansas, 21st; Yates Centre, Kansas, 30th; Fort Scott, Kansas, 16th, 18th, 28; Pretty Prairie, Kan-

sas, 7th; Dubuque, Iowa, 7th; Davenport, Iowa, 17th, 29th; Des Moines, Iowa, 16th; Monticello, Iowa, 23d; Portland, Oregon, 2d; Port Huron, Michigan, flying east, 20th; Cape Lookout, North Carolina, appearing in large numbers, 13th, 17th, 21st.

*Cranes flying south:* Tobacco Garden, Dakota, 9th, 17th, 22d; Creswell, Kansas, 26th; Yates Centre, Kansas, 26th; Pretty Prairie, Kansas, 7th; Embarrass, Wisconsin, 21st.

*Brants flying south:* Independence, Kansas, 18th, 25th; Yates Centre, Kansas, 24th.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR:

W. B. HAZEN,

Brig. & Bvt. Maj. Gen'l,  
Chief Signal Officer, U. S. A.

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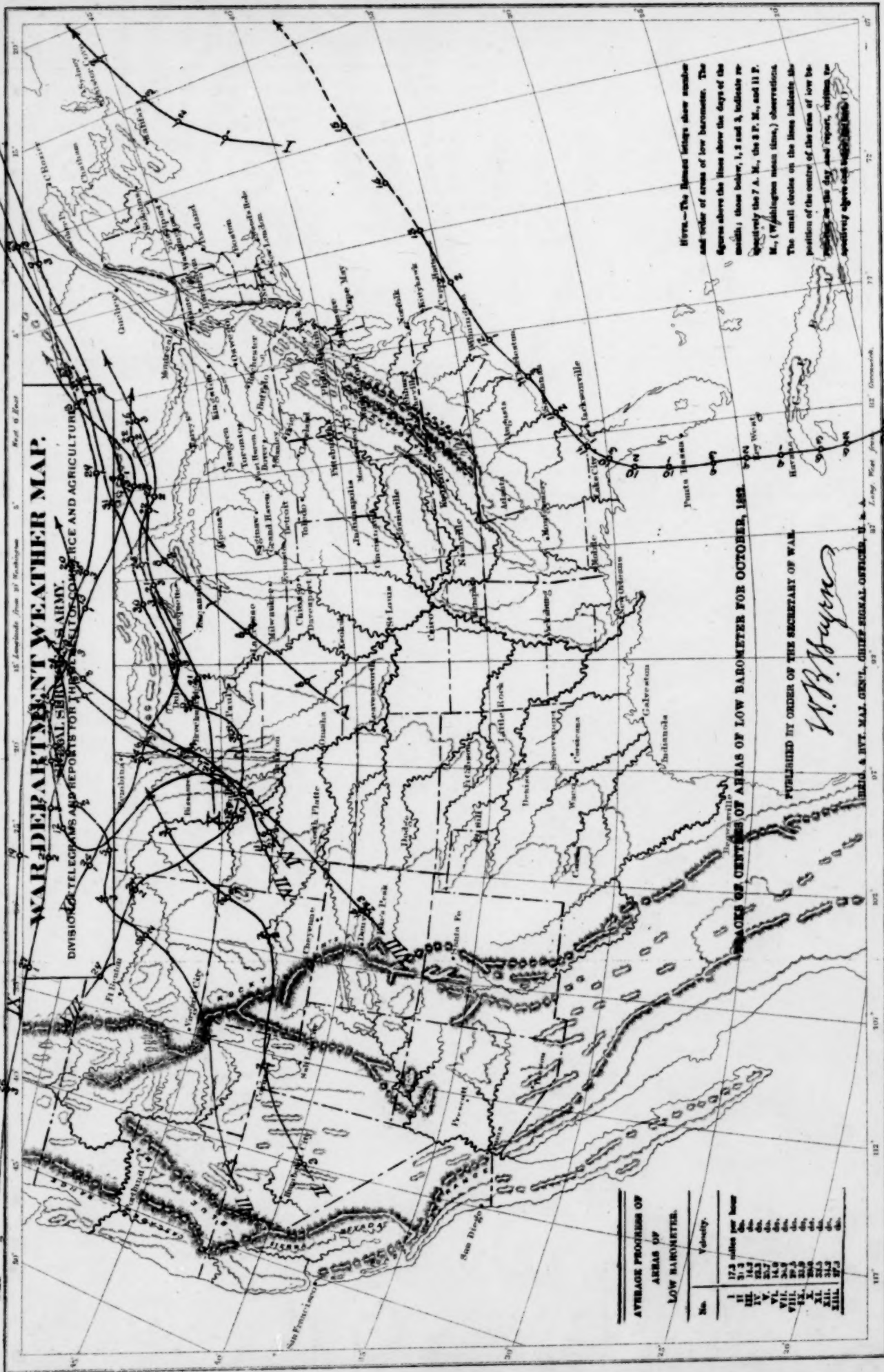
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# WAR DEPARTMENT WEATHER MAP.

DIVISION OF TELEGRAPHS AND REPORTS FOR THE ARMY, NAVY, AND AGRICULTURE.



AVERAGE PROGRESS OF  
AREAS OF  
LOW BAROMETER.

No.	Velocity.
I.	17.5 miles per hour
II.	14.5
III.	12.5
IV.	10.5
V.	8.5
VI.	6.5
VII.	4.5
VIII.	2.5
IX.	0.5
X.	0.5
XI.	0.5
XII.	0.5
XIII.	0.5

Here—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7 A. M., the 3 P. M., and 11 P. M. (Washington mean time.) observations. The small circles on the lines indicate the position of the center of the area of low barometer on the day and report, station for which they were observed.

TRACKS OF CENTERS OF AREAS OF LOW BAROMETER FOR OCTOBER, 1918.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

*W. H. H. H.*

HEAD & BYT. MAJ. GEN'L. CHIEF SIGNAL OFFICER, U. S. A.

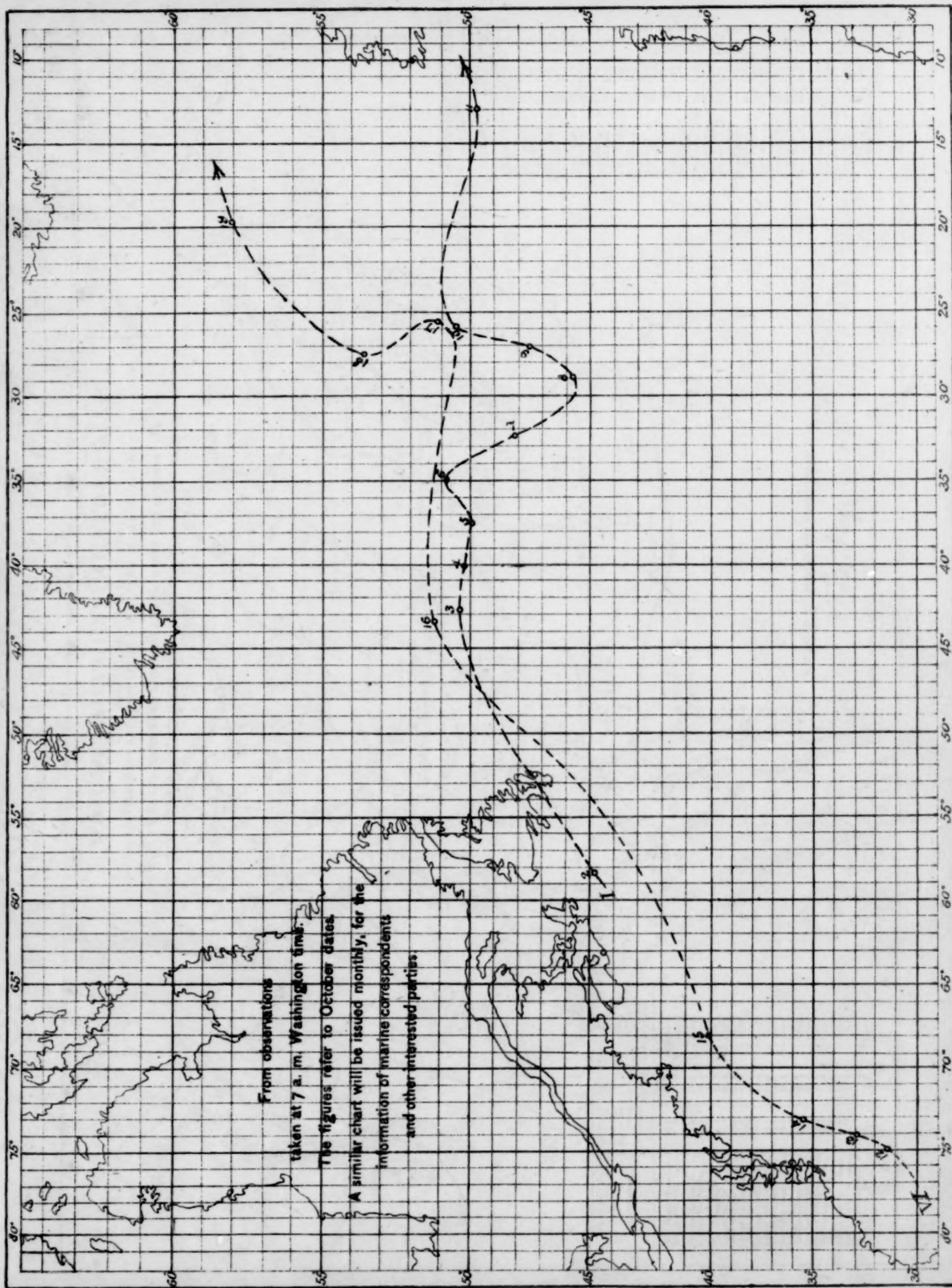


Wigwag

Wigwag

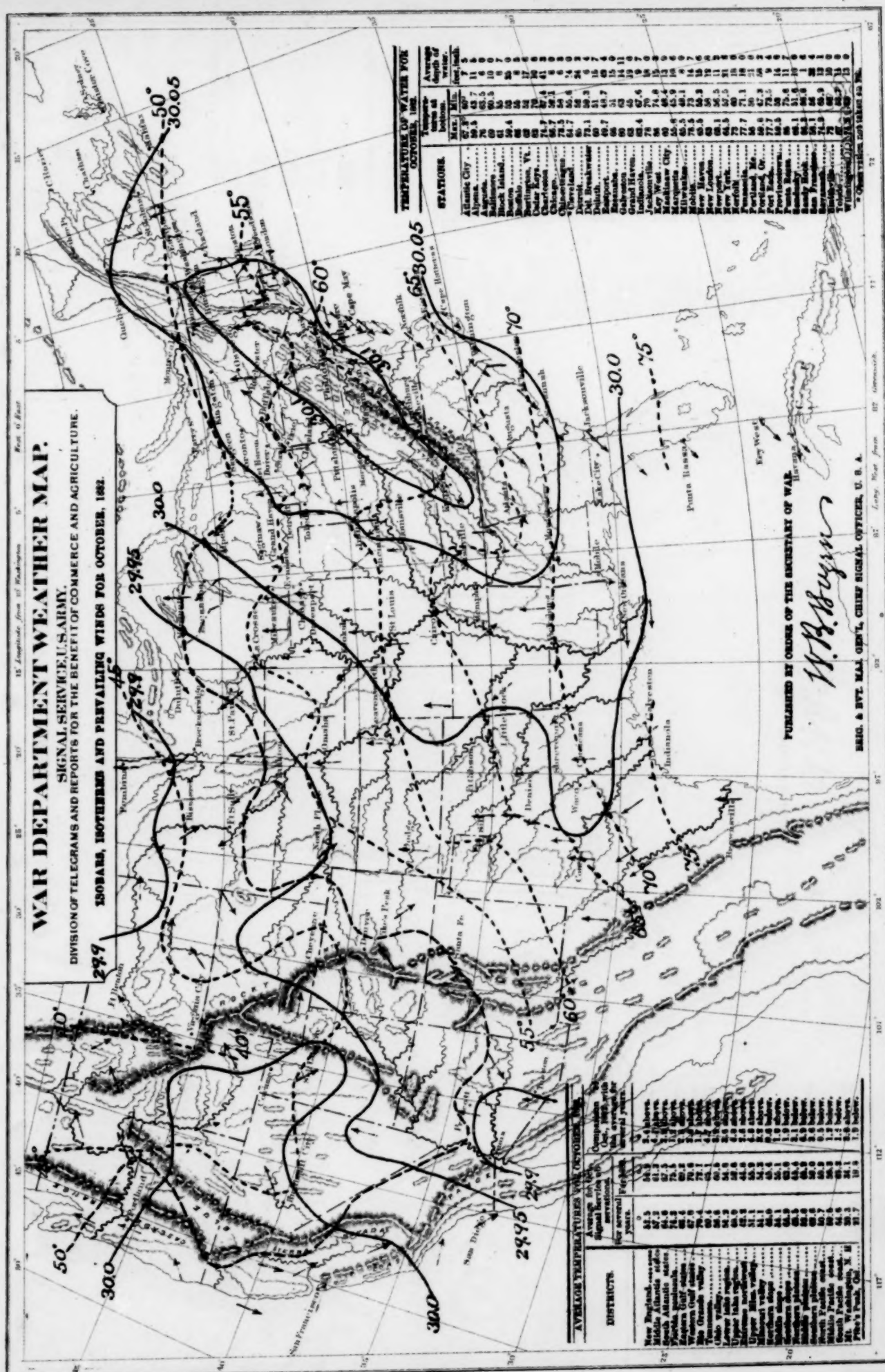


CHART SUPPLEMENTAL TO NO. 1.  
Showing tracks of storm-centres on the Atlantic Ocean, after leaving the coast of America, based upon data received up to November 25.

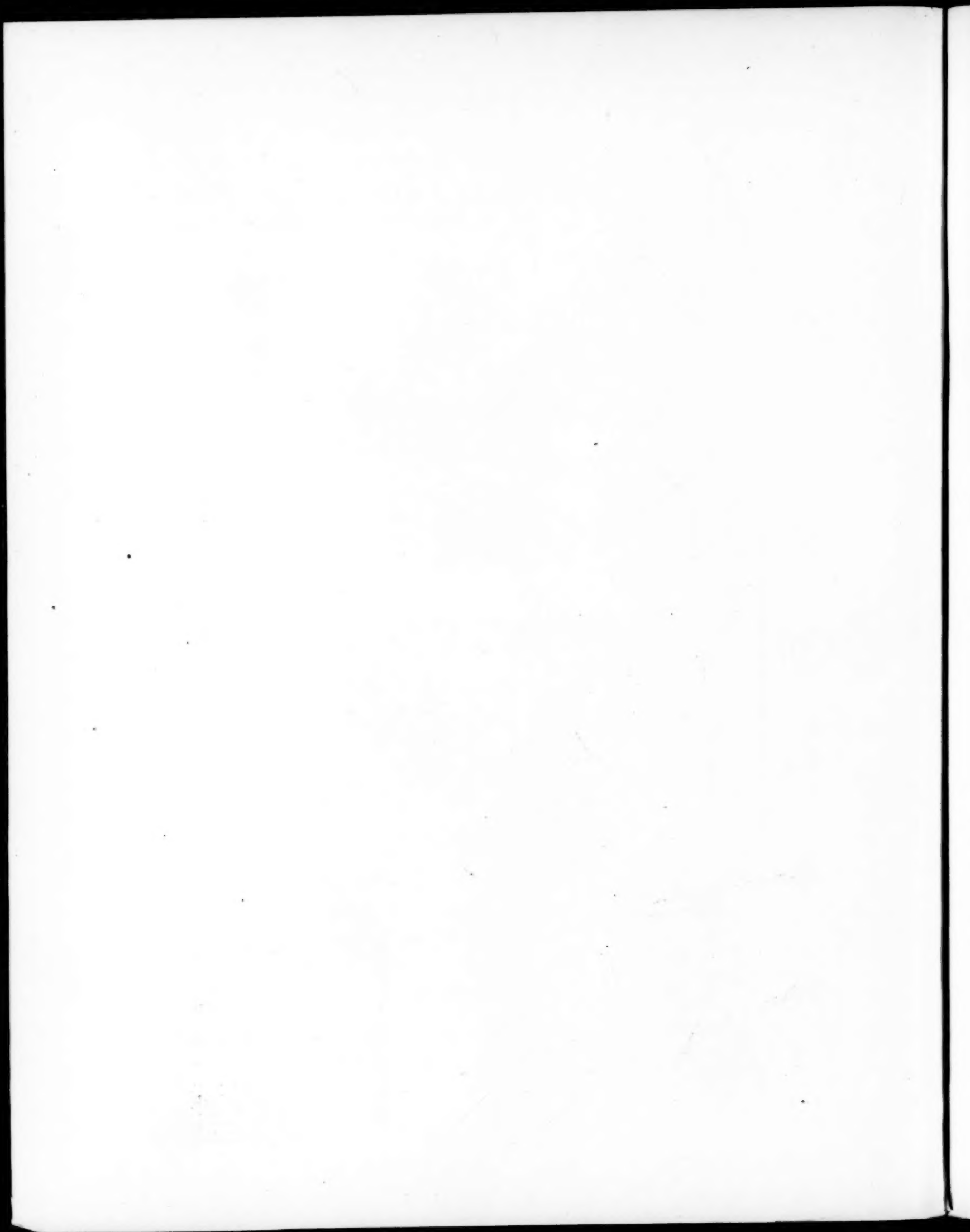








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*W. H. H. H.*  
SING. & BYT. MAJ. GEN'L. CHIEF SIGNAL OFFICER, U. S. A.





## PRECIPITATION CHART FOR OCTOBER, 1882.

[illegible]

withhold it

UNION. RY. MAJ. GEN'L. CHIEF SIGNAL OFFICER, U. S. A.

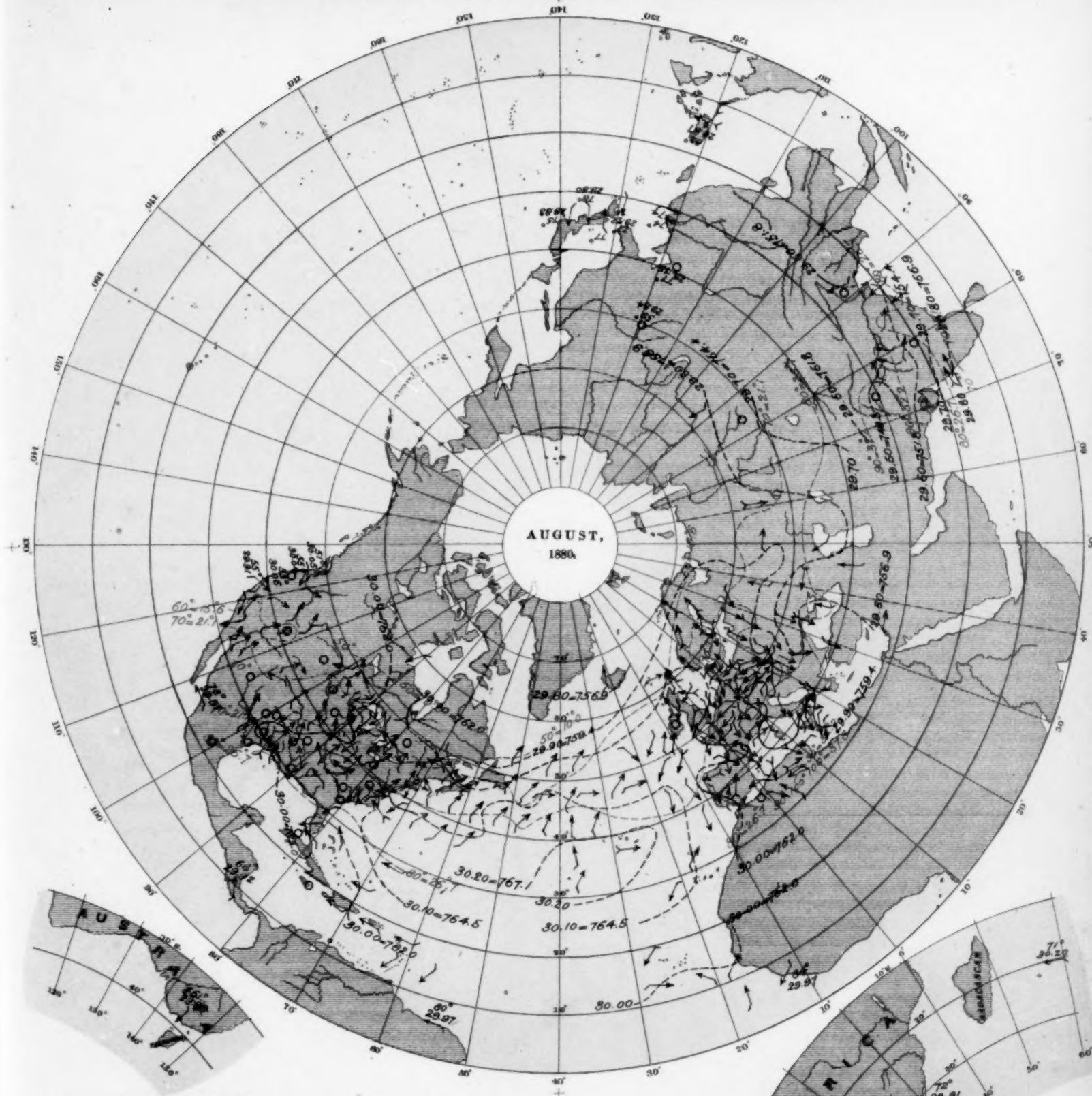


III 44



**Office of the Chief Signal Officer,**  
**UNITED STATES ARMY.**  
 Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.

No. V.



**PREVAILING WINDS.**

Arrows show the direction of, and fly with, the wind.  
 Force is shown as follows:

SYMBOLS.	FORCE.	VELOCITY.	
		Miles per hour.	Metres per second.
	0	0	0
	1, 2	0 to 9	0 to 4.0
	3, 4	9.1 to 22.5	4.1 to 10.1
	5, 6	22.6 to 40.5	10.1 to 18.1
	7, 8	40.6 to 67.5	18.1 to 30.2
	9, 10	67.6 up.	30.2 & over.

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*W. H. Hays*

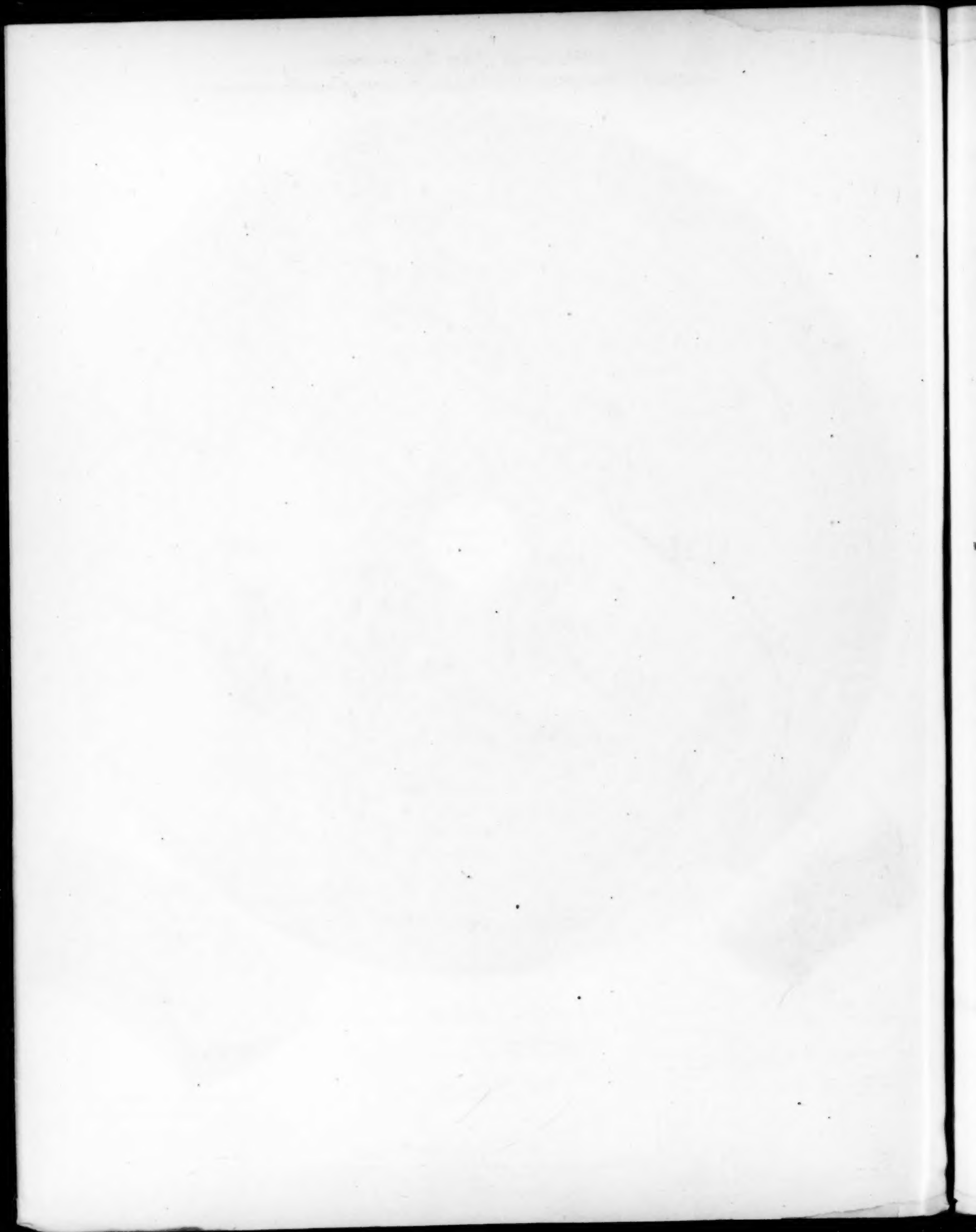
Brig. & Bvt. Maj. Gen'l,  
 Chief Signal Officer, U. S. A.

**INTERNATIONAL MONTHLY CHART.**

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at  
 7:30 A. M., Washington mean time, for the month of August, 1880, based  
 on the daily charts of the International Bulletin.

**ISOBARS AND ISOTHERMS.**

Isobars in blue; detached barometer means  
 in English inches.  
 Isotherms in red; detached temperature  
 means in degrees Fahrenheit.  
 Broken lines, are doubtful.



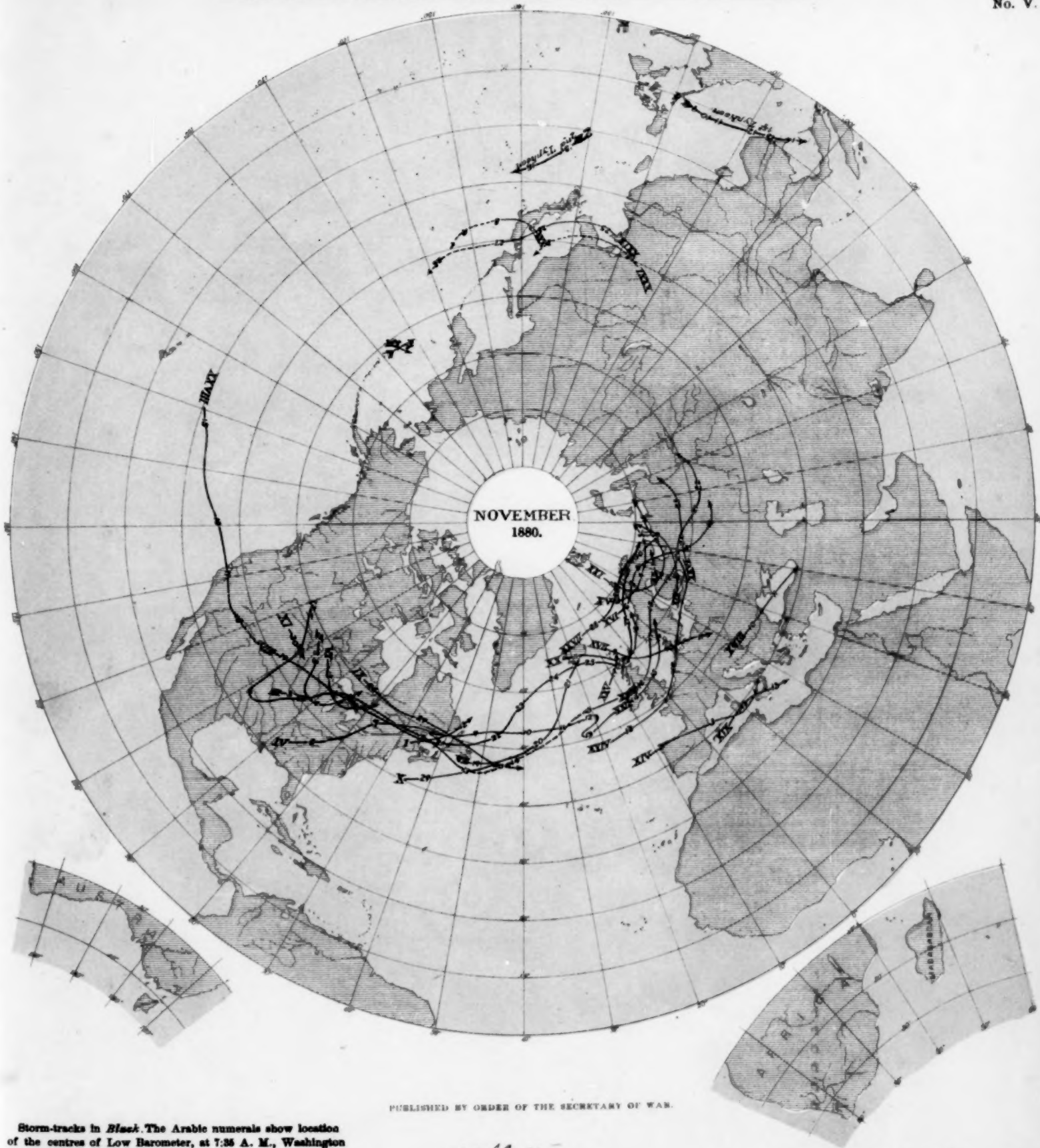


Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. V.



Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.  
Broken or dotted lines, are doubtful.

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*W. B. Bryan*

BRIG & BVT MAJ GEN'L  
CHIEF SIGNAL OFFICER, U. S. A.

INTERNATIONAL CHART.

Showing Tracks of Centres of Low Barometer for  
November, 1880.